RELOCATION OF THE AIR NATIONAL GUARD 176TH WING TO ELMENDORF AFB, ALASKA

ENVIRONMENTAL ASSESSMENT

September 2007

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14. ABSTRACT

This EA has been prepared in accordance with the National Environmental Policy Act (NEPA). Specific environmental resources associated with Elmendorf AFB with the potential for environmental consequences considered in this EA include airspace management and air traffic control (including airport traffic), noise, safety, air quality physical resources, biological resources, cultural resources, land use and transportation, socioeconomics, and environmental justice. Under the Proposed Action, airspace management would not be impacted. There would be no change in noise contours or sound levels beyond those for currently scheduled aircraft. Construction, renovation, and infrastructure upgrades associated with the Proposed Action would affect a total area of approximately 21 acres within the developed portion of Elmendorf AFB. The northern margin of project area would result in removal of some second growth forest along Airlifter Drive within a total area of 9.4 acres. No construction projects are sited in wetlands, floodplains, or areas prone to permafrost. The generation of waste is consistent with normal base activity. The proposed construction and renovation are sited within 200 feet of nine environmental sites. One structure scheduled for renovation is eligible for the National Register of Historic Places (NRHP). The setting of one NRHP-eligible structure may be affected by new facilities construction in its vicinity. Seven buildings scheduled for renovation have not been evaluated for NRHP eligibility and are potentially eligible. As specified in the Integrated Cultural Resources Management Plan (ICRMP), compliance with Section 106 of NRHP, including State Historic Preservation Office (SHPO) consultation regarding the NRHP-eligible structures scheduled for exterior renovation and potentially affected by new facilities construction has been initiated and will be completed. Unknown subsurface archaeological resources could be impacted by ground disturbing activities; ICRMP guidelines would be followed. Some temporary construction-related traffic congestion along Airlifter Drive thoroughfare would occur. Shift in traditional guardsmen to Elmendorf would result in increase of weekend activity and some traffic. Infrastructure is expected to be improved with new or renovated buildings and resurfacing and road realignment, but no adverse impact expected. The proposal would not change long-term base employment or expenditures. In addition, the actions as proposed would not disproportionately impact minority and low-income populations or children. Under the No Action Alternative, the 176 WG would not beddown at Elmendorf AFB. The results of the No Action Alternative include: no reverse association, resulting in loss of medium lift mission; no ability of active duty and ANG to share airfield elements; failure to advance the Air Force?s directive for the formation of ANG/active duty

15. SUBJECT TERMS

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FINDING OF NO SIGNIFICANT IMPACT

NAME OF PROPOSED ACTION. Relocation of the Air National Guard (ANG) 176th Wing (176 WG) to Elmendorf Air Force Base (AFB), Alaska.

DESCRIPTION OF THE PROPOSED ACTION AND NO ACTION ALTERNATIVES. The United States Air Force (Air Force) proposes to relocate the 176 WG of the Alaska Air National Guard (AKANG) to Elmendorf AFB, Alaska. Under the Proposed Action, 12 C-130H aircraft, three HC-130N aircraft, and five HH-60G Pave Hawk helicopters would be relocated to Elmendorf AFB. The C-130H aircraft would support the mission of Elmendorf C-130H aircraft that departed in early 2007. These aircraft operate with the 144th Airlift Squadron (144 AS), 210th Rescue Squadron (210 RQS), and 211th Rescue Squadron (211 RQS). In addition, AKANG expeditionary support elements would relocate from Kulis Air National Guard Base (ANGB) to Elmendorf AFB resulting in the development of the reverse association between traditional guard and active duty Air Force elements at Elmendorf AFB.

The Proposed Action would consolidate 176 WG aircraft operations, maintenance, and unmanned functions. The relocation would require 22 new construction and renovation projects projected to occur over a period of three years at a cost of approximately $160 million in military construction (MILCON) and operations and maintenance dollars. Most projects would occur between Fiscal Year (FY) 2008 and FY2011.

Training and operational airspace use would remain identical to that currently associated with airlift and search and rescue missions of the 176 WG at Kulis ANGB. Under the Proposed Action, C-130 flight operations at Elmendorf AFB would be comparable to those associated with Air Force C-130 aircraft recently relocated from Elmendorf; flight operations for the HH-60Gs would be as currently flown from Kulis. The only change would be a shift in the departure and return location of ANG aircraft to Elmendorf AFB, approximately 5 miles northeast of Kulis ANGB.

The No Action Alternative would not locate the 176 Wing at Elmendorf AFB and could affect the schedule for implementing Base Realignment and Closure (BRAC) 2005 actions.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES. The Environmental Assessment (EA) addresses the potential environmental consequences from implementing the Proposed Action and includes the No Action Alternative. Through agency and public inputs, the following resource areas were identified for assessment of potential direct or indirect environmental consequences: airspace management and air traffic control, noise, safety, air quality, physical resources, biological resources, cultural resources, land use and transportation, socioeconomics, and environmental justice. Potential cumulative effects for each relevant resource are also presented.

The EA demonstrates that the proposed relocation of the ANG 176 WG would not result in significant environmental impacts to any environmental resource area. Potential environmental consequences may be summarized as follows. Under the Proposed Action, airspace management would not be impacted. There would be no change in noise contours or sound levels beyond those for currently scheduled aircraft. Construction, renovation, and infrastructure upgrades associated with the Proposed Action would affect a total area of approximately 21 acres within the developed portion of Elmendorf AFB. The northern margin of project area would result in removal of some second growth forest along Airlifter Drive

within a total area of 9.4 acres. No construction projects are sited in wetlands, floodplains, or areas prone to permafrost. The proposed construction and renovation are sited within 200 feet of nine environmental sites. Project design and coordination with the Environmental Office prior to any construction would occur to ensure that ongoing Environmental Program remediation or investigation activities are not impaired. One structure scheduled for renovation is eligible for the National Register of Historic Places (NRHP). The setting of one NRHP-eligible structure may be affected by new facilities construction in its vicinity. Seven buildings scheduled for renovation have not been evaluated for NRHP eligibility and are potentially eligible. As specified in the Integrated Cultural Resources Management Plan (ICRMP), compliance with Section 106 of NRHP, including State Historic Preservation Office (SHPO) consultation regarding the NRHP-eligible structures scheduled for exterior renovation and potentially affected by new facilities construction has been initiated and will be completed. Unknown subsurface archaeological resources could be impacted by ground disturbing activities; ICRMP guidelines would be followed. Some temporary construction-related traffic congestion along Airlifter Drive thoroughfare would occur. Shift in traditional guardsmen to Elmendorf would result in increase of weekend activity and additional weekend traffic. Infrastructure is expected to be improved with new or renovated buildings and resurfacing and road realignment, but no adverse impact expected. The proposal would not change long-term base employment or expenditures. In addition, the actions as proposed would not disproportionately impact minority and low-income populations or children.

Under the No Action Alternative, the 176 WG would not beddown at Elmendorf AFB. The results of the No Action Alternative include: no reverse association, resulting in loss of medium lift mission; no ability of active duty and ANG to share airfield elements; failure to advance the Air Force's directive for the formation of ANG/active duty associations; and failure to comply with BRAC 2005 commission recommendations.

Based on the findings of the Proposed Action conducted in accordance with the requirements of the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations, and implementing regulations set forth in 32 Code of Federal Regulations (CFR) 989 (Environmental Impact Analysis Process), as amended, it is concluded that implementation of the Proposed Action would not result in significant impacts to the quality of the human or natural environment. For these reasons, a finding of no significant impact is made and preparation of an Environmental Impact Statement is not warranted. An EA, dated September 2007, incorporates the July 2007 EA as amended by public comments received during a 30-day public comment period and is on file at:

3rd Wing Public Affairs
Environmental Community Affairs Coordinator
10480 22nd Street, Suite 120
Elmendorf AFB AK 99506

Tom

02 Oct 07

THOMAS L. TINSLEY
Brigadier General, USAF
3rd Wing Commander
Elmendorf Air Force Base, Alaska

Date

ACRONYMS AND ABBREVIATIONS

3 WG	3rd Wing
144 AS	144th Airlift Squadron
168 ARW	168th Air Refueling Wing
176 COMPG	176th Composite Group
176 TAG	176th Tactical Airlift Group
176 WG	176th Wing
210 RQS	210th Rescue Squadron
211 RQS	211th Rescue Squadron
517 AS	517th Airlift Squadron
AAFES	Army and Air Force Exchange Service
AATA	Anchorage Alaska Terminal Area
AFB	Air Force Base
AFI	Air Force Instruction
AFSC	Air Force Safety Center
AGL	above ground level
AICUZ	Air Installation Compatible Use Zone
Air Force	United States Air Force
AKANG	Alaska Air National Guard
ANG	Air National Guard
ANGB	Air National Guard Base
APZ	Accident Potential Zone
AQCR	Air Quality Control Region
Army	United States Army
ATC	Air Traffic Control
BASH	Bird-Aircraft Strike Hazard
BMP	Best Management Practice
BRAC	Base Realignment and Closure
CAA	Clean Air Act
CATM	Combat Arms Training Maintenance
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIRI	Cook Inlet Region, Inc.
CO	carbon monoxide
CZ	Clear Zone
dB	decibel
DoD	Department of Defense
EA	Environmental Assessment
EO	Executive Order
EOD	explosive ordnance disposal
ERP	Environmental Restoration Program
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FOD	Foreign Object Debris
FY	Fiscal Year
HAP	High Accident Potential
HAZMART	Hazardous Materials Pharmacy
Hz	hertz (cycles per second)
ICRMP	Integrated Cultural Resources Management Plan
IFR	Instrument Flight Rule
IICEP	Interagency and Intergovernmental Coordination for Environmental Planning
L_{dn}	Day-Night Average Sound Level
L_{dnmr}	Onset-Rate Adjusted Monthly Day-Night Average Sound Level
L_{max}	maximum sound level
LRS	Logistics Readiness Squadron
MILCON	military construction
MSL	mean sea level
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NRIS	National Register Information Service
NSR	New Source Review
O_3	ozone
ORL	Owner Requested Limit
P.L.	Public Law
PACAF	Pacific Air Forces
PAI	Primary Aircraft Inventory
Pb	lead
PM_{10}	particulate matter less than or equal to 10 micrometers in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 micrometers in diameter
ppm	parts per million
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
SEL	Sound Exposure Level
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO_2	sulfur dioxide
SO_x	sulfur oxides
SPCC	Spill Prevention Control and Countermeasures Plan
SWPPP	Storm Water Pollution Prevention Plan
TPY	tons per year
TSDF	Treatment, Storage, and Disposal Facility
U.S.	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	underground storage tank
VFR	Visual Flight Rule
VOC	volatile organic compound
$\mu g/m^3$	micrograms per cubic meter

Cover Sheet

ENVIRONMENTAL ASSESSMENT (EA) FOR THE RELOCATION OF THE AIR NATIONAL GUARD 176TH WING TO ELMENDORF AFB, ALASKA

a. *Responsible Agency:* United States Air Force (Air Force)

b. *Proposals and Actions*: The Air Force proposes to relocate the 176th Wing (176 WG) of the Alaska Air National Guard (AKANG) to Elmendorf Air Force Base (AFB), Alaska. Under the Proposed Action, 12 C-130H aircraft, three HC-130N aircraft, and five HH-60G Pave Hawk helicopters would be relocated to Elmendorf AFB. The C-130H aircraft would support the mission of Elmendorf C-130H aircraft that departed in early 2007. These aircraft operate with the 144th Airlift Squadron (144 AS), 210th Rescue Squadron (210 RQS), and 211th Rescue Squadron (211 RQS). In addition, AKANG expeditionary support elements would relocate from Kulis Air National Guard Base (ANGB) to Elmendorf AFB resulting in the development of the reverse association between traditional guard and active duty Air Force elements at Elmendorf AFB.

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The No Action Alternative would not locate the 176 Wing at Elmendorf AFB and could affect the schedule for implementing Base Realignment and Closure (BRAC) 2005 actions.

c. *For Additional Information:* 3rd Wing Public Affairs, Environmental Community Affairs Coordinator, 10480 22nd St., Ste. 118, Elmendorf AFB AK 99506. Telephone inquiries may be made to 907-552-8152.

d. *Designation:* Environmental Assessment

e. *Abstract:* This EA has been prepared in accordance with the National Environmental Policy Act (NEPA). Specific environmental resources associated with Elmendorf AFB with the potential for environmental consequences considered in this EA include airspace management and air traffic control (including airport traffic), noise, safety, air quality, physical resources, biological resources, cultural resources, land use and transportation, socioeconomics, and environmental justice.

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3rd Wing Public Affairs
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02 Oct 07

THOMAS L. TINSLEY
Brigadier General, USAF
3rd Wing Commander
Elmendorf Air Force Base, Alaska

Date

ENVIRONMENTAL ASSESSMENT

RELOCATION OF THE AIR NATIONAL GUARD 176TH WING TO ELMENDORF AFB, ALASKA

SEPTEMBER 2007

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FIGURES

1.0 PURPOSE AND NEED FOR 176TH WING BEDDOWN

On September 8, 2005, the 2005 Defense Base Realignment and Closure (BRAC) Commission report recommended that Kulis Air National Guard Base (ANGB) close and the 176th Wing (176 WG) of the Alaska Air National Guard (AKANG) be reassigned and located to Elmendorf Air Force Base (AFB) pending the acquisition of sufficient funds for needed facility improvements. With the recent allocation of sufficient military construction funding, relocation to Elmendorf AFB is financially feasible. This Environmental Assessment (EA) analyzes the consequence of this relocation on both human and natural environments and considers the broader cumulative effects the action may have in conjunction with current and future activities within the potentially affected environment. The Proposed Action would involve the beddown, or placement, of the 176 WG and all associated aircraft and expeditionary combat support elements at Elmendorf AFB.

The United States Air Force (Air Force) proposes to beddown the 176 WG of the AKANG from Kulis ANGB on the west side of the Municipality of Anchorage to Elmendorf AFB on the north side of the Municipality of Anchorage. The purpose of the Proposed Action is to establish and support the 176 WG at Elmendorf AFB. The Proposed Action is needed to maintain the mission of the 176 WG in Alaska while supporting the recommendations of the BRAC Commission, reducing redundant infrastructure by consolidating the functions of two Air Force installations in the Greater Anchorage Area, and fostering the development of reverse association between traditional guard and active duty Air Force elements.

Beddown of the 176 WG at Elmendorf would involve the placement of 12 C-130H, three HC-130N, and five HH-60G aircraft, for a total of 20 aircraft; construction of new facilities; renovation or modification of some existing facilities; replacement of support equipment; and a shift in full time and traditional Air National Guard (ANG) personnel from their current assignment at Kulis ANGB to Elmendorf AFB (Air Force 2004a). The 15 C-130-type aircraft involved in the beddown would replace 18 C-130 aircraft that have recently departed as part of a separate action. Because of a historic C-130 mission at Elmendorf AFB, opportunities are present to utilize pre-existing infrastructure.

This EA analyzes the potential environmental consequences associated with locating the 176 WG of the AKANG to Elmendorf AFB according to the requirements of the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality (CEQ) Regulation of 1978, and 32 Code of Federal Regulations (CFR) Part 989, titled the Environmental Impact Analysis Process. 32 CFR Part 989 addresses the implementation of NEPA and directs Air Force officials to consider the environmental consequences of any proposal as part of the decision-making process.

1.1 Background

The presence of the ANG in Alaska was established in 1952 with the formation of the 8144th Air Base Squadron originally based at Elmendorf AFB under the command of Alaskan Air Command. The next 35 years witnessed the relocation of AKANG functions to Kulis ANGB, rotations to new gaining commands, and operations transitioning through an assortment of contemporary aircraft, but always a consistent mission centered first on airlift operations and then on both airlift and aerial refueling operations. In 1986, a secondary refueling squadron flying KC-130 Stratotankers operating out of Eielson AFB was established. This squadron eventually became the autonomous 168th Air Refueling Wing (168 ARW) providing essential support to Air Force training operations within the vast Pacific Alaska Range Complex. In 1987, AKANG elements at Kulis ANGB assumed the Air Force's search and rescue mission in Alaska.

1.1.1 Air National Guard/176th Wing

The 176 WG finds its roots with the 176th Tactical Airlift Group (176 TAG) as the AKANG parent organization established in 1969. When the 176 TAG's original airlift mission was combined with an aerial refueling mission in 1986, it was renamed the 176th Composite Group (176 COMPG) to reflect this mission expansion. This designation persisted until 1993 when the 176 COMPG became the 176 Group under the gaining command of Pacific Air Forces (PACAF). In 1995, the 176 Group was re-designated the 176 WG.

The primary missions of the 176 WG are airlift support and the search and rescue mission in Alaska. The 176 WG is composed of three flying squadrons, the 144th Airlift Squadron (144 AS) and the 210th Rescue Squadron (210 RQS), and the 211 RQS, as well as support units. Because of its proximity to both European and Asian theaters and location in a region of expansive wilderness, occasionally brutal climate, isolated settlements, active geology, and intensive marine commerce, the 176 WG is presented with substantial state and federal missions. The state mission is to provide the same capability within the state of Alaska at the behest of the Governor. The federal mission is to train and maintain competent aircrews and support personnel for airlifts and airdrops in Alaska and for military conflicts worldwide. In addition, the 210 RQS is tasked to equip and maintain a combat-ready rescue capability with a 24-hour, 365-day a year alert status. The 210 RQS is prepared to respond immediately to natural or civil disasters, remote rescue operations, and maritime emergencies within the operating range of its aircraft.

To support these missions, the 176 WG maintains C-130 fixed-wing aircraft and HH-60G Pave Hawk helicopters. The Proposed Action includes eight C-130Hs and three HC-130Ns from Kulis ANGB, four additional C-130-type aircraft from Texas, and five HH-60Gs. Under BRAC 2005, the 176 WG will retain its state mission while providing support to active duty Air Force.

1.1.2 Aircraft Characteristics of the C-130, HC-130P/N, HH-60G

The original C-130 aircraft was created in the mid 1950s. The C-130 is used for a variety of missions with a focus on airlift support and resupply. With its large loading ramp and door, it can accommodate oversized cargo easily. All C-130s are four engine turboprop fixed wing aircraft.

The HC-130N was first flown in 1964 serving many roles and missions, including search and rescue and in-flight helicopter refuel. It typically carries a crew of five. The HC-130N crews train to fly night, low-level, air refueling and airdrop operations using night vision goggles.

The HH-60G Pave Hawk helicopter was first deployed in 1982. Its main role is for search and rescue missions. It is also used for emergency evacuation, disaster relief, and other activities. It is equipped with a personnel locating system providing range and bearing information and a hoist capable of lifting loads up to 600 pounds at 200 feet hover. This twin-engine medium-lift helicopter is equipped with an automatic flight control system, night vision goggles lighting, and a forward looking infrared system to enhance night low-level operations. It also has a radar warning receiver, infrared jammer, and a countermeasure dispensing system.

1.1.3 Elmendorf AFB

Elmendorf AFB, located to the north of Anchorage, Alaska, is part of PACAF, which is headquartered at Hickam AFB, Hawaii. Elmendorf AFB is the home of the Alaskan Command, 11th Air Force, Alaskan North American Air Defense region, and the 3rd Wing (3 WG). The 3 WG encompasses two squadrons of F-15Cs (42 aircraft), and a limited number of C-12 and E-3 aircraft. Additionally, 18 C-130 transports and 18 F-15E aircraft departed in early 2007; 8 C-17 transports are scheduled to beddown in late 2007 (Air Force 2004a). Two squadrons of F-22A Raptors (36 aircraft) are scheduled to replace Elmendorf's F-15Cs by 2011. As depicted in Figure 1.1-1, Elmendorf AFB shares boundaries with the Army's Fort Richardson to the east, the Municipality of Anchorage to the south, and the Knik Arm of Cook Inlet to the west and north. Elmendorf AFB covers 13,455 acres, with the improved areas consisting of 3,713 acres, including a 10,000-foot main runway and a 7,500-foot cross-runway.

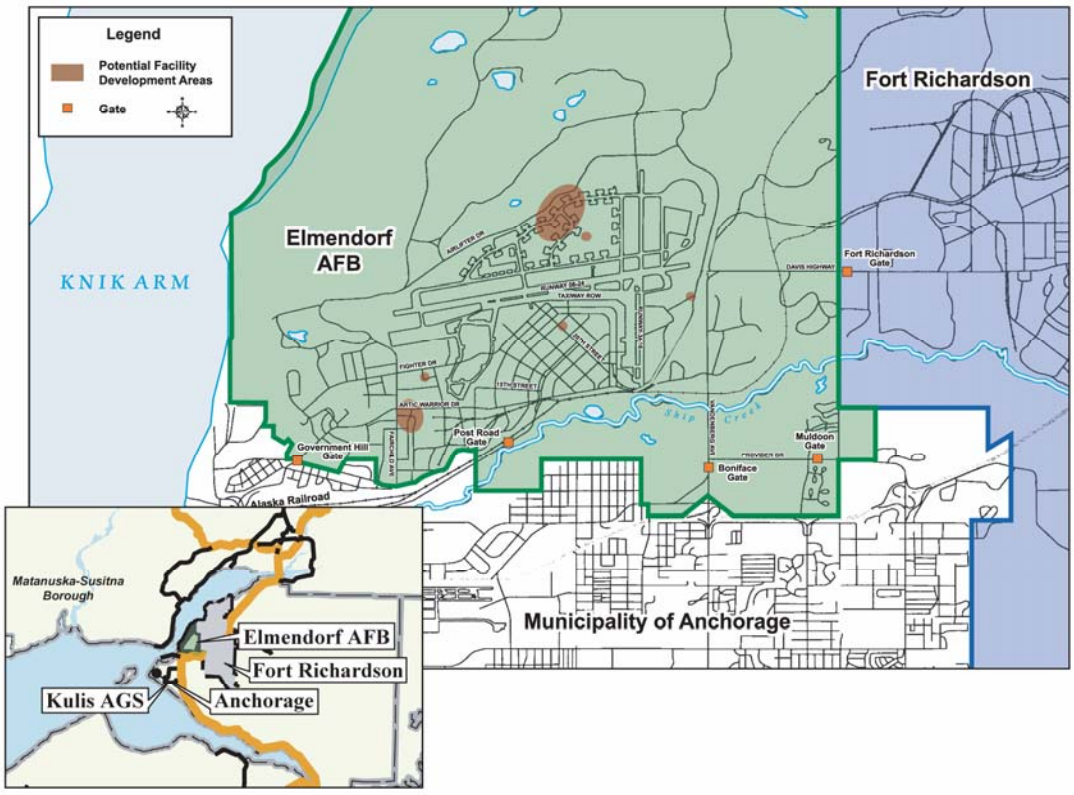

Figure 1.1-1. Regional Location of Elmendorf AFB, Alaska

Throughout its history, Elmendorf AFB has based large numbers of host and tenant aircraft to enforce national interests in World War II, Korean War, Vietnam War, Cold War, Gulf War, and Global War on Terror. In addition, the base routinely provides technical and infrastructure support for major flying exercises and visiting wings and allied forces. The proposed beddown of aircraft associated with the 176 WG would be absorbed readily into Elmendorf AFB. Some re-tooling and upgrading of existing facilities and new construction have been identified to create a proposed 176 WG Area of Operations within Elmendorf and support AKANG fixed wing aircraft and helicopters.

1.2 Purpose and Need

The critical nature of the role of the Air Force in Alaska in the defense of the United States (U.S.) and in supporting the directives of the President and the Secretary of Defense has been demonstrated since the first simple airfields constructed during World War II. Alaska's proximity to Asian and European theaters, location at a critical U.S. frontier, and unique environment present challenges that have been met through the years by hard work, intense training and technology. The limits of men and machines are often tested by the distance and climate. The purpose of the Proposed Action is to relocate and support the 176 WG at Elmendorf in order to maintain a highly skilled ANG capability to continue to successfully meet these challenges. The Proposed Action would permit the Air Force to retain effective search and rescue and expeditionary support missions in Alaska while providing an overall cost savings to the Department of Defense (DoD) by consolidating two installations. Relocation of the 176 WG of the AKANG will provide greater capability at Elmendorf AFB and support an active duty reverse association with traditional guardsmen of the AKANG. The Air Force's official website explains the benefits of jointly locating active duty and guardsmen (Air Force 2005a):

> "This is part of a larger effort across the Air Force forming reverse associate units. Active duty manpower and crews will share in the operation and maintenance of reserve component aircraft. This will provide the active duty with greater access to reserve component airframes and creates opportunities for seasoning active duty members through association with the corporate experience retained in the reserve component. Creation of an associate unit at Elmendorf allows for support of active duty members assigned to the associate unit."

Because Kulis ANGB has been scheduled for closure under BRAC 2005, relocation of the 176 WG to Elmendorf AFB is needed to maintain the critical airlift and search and rescue capacity in the Alaskan Theatre. In addition, it is needed to implement the Air Force directive for establishing active duty/guard associations, to diminish socioeconomic impacts of Kulis ANGB closure, to support future mission growth, and realize efficiencies gained through integrating the operations and support functions of the two separate wings.

1.3 Kulis Base Realignment and Closure

Recent BRAC 2005 recommendations for Alaska (Appendix A) included the closure of Kulis ANGB and the relocation of the 176 WG and its capabilities to an alternate beddown site. Pending identification of adequate construction funds, Elmendorf AFB was recommended as the new beddown site. Kulis ANGB has been located at the airfield of Ted Stevens International

Airport in Anchorage and has been the site of AKANG command since 1955. Under BRAC 2005, the 176 WG, its associated aircraft (eight C-130Hs, three HC-130Ns, and five HH-60Gs) and expeditionary combat support elements would move to Elmendorf AFB. In addition, four C-130H aircraft from Dyess AFB, Texas, would be added to the 176 WG inventory for a total of 12 C-130H aircraft. The result of this realignment and merging of capability would be the

- formation of an ANG/active duty reverse association,
- shared use of infrastructure by active duty Air Force and traditional ANG personnel,
- consolidation of two installations within a single metropolitan area, and
- freeing-up of real estate for future growth at Ted Stevens International Airport.

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2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

The Proposed Action is to relocate the 176 WG of the AKANG at Elmendorf AFB, Alaska. This chapter describes the Proposed Action and considered alternative beddown siting locations identified during proposal development. The No Action Alternative, which would not beddown the 176 WG at Elmendorf AFB, is also discussed. The term beddown means the non-transient placing or location of aircraft at an installation as well as the sustainment of all required ground support for these aircraft. With implementation of the Proposed Action, the 176 WG would become an Elmendorf AFB tenant hosted by the Air Force's 3 WG.

Placement of the 176 WG of the AKANG, including associated aircraft, and expeditionary support elements is proposed to occur no later than 15 September 2011. Upgrades to existing infrastructure and new construction would occur over a period of approximately three years to prepare facilities to support the beddown. Because Elmendorf AFB has supported a C-130 mission for over 43 years, many efficiencies are gained through the re-use or renovation of existing facilities. In addition, the 176 WG would gain and consolidate manpower and resources support for maintenance and operations.

Under the Proposed Action, 12 C-130H aircraft, three HC-130N aircraft, and five HH-60G Pave Hawk helicopters would be located to Elmendorf AFB. The C-130H aircraft would support the mission of Elmendorf C-130H aircraft that departed in early 2007. Total aircraft under the Proposed Action are: 12 C-130H, three HC-130Ns, and five HH-60Gs. These aircraft operate with the 144 AS and 210 RQS. In addition, AKANG expeditionary support elements would relocate from Kulis ANGB to Elmendorf AFB resulting in a complete functioning AKANG Wing embedded within Elmendorf AFB.

Training and operational airspace use would remain identical to that currently associated with airlift and search and rescue missions of the 176 WG at Kulis ANGB. Under the Proposed Action, C-130 flight operations at Elmendorf AFB would be comparable to those associated with Air Force C-130 aircraft recently relocated from Elmendorf; flight operations for the HH-60Gs would be as currently flown from Kulis. The only change would be a shift in the departure and return location of ANG aircraft to Elmendorf AFB, approximately 5 miles northeast of Kulis ANGB.

2.1 Proposed Action

A variety of infrastructure modifications and new construction projects would be required to support the relocation of the 176 WG at Elmendorf AFB, under the Proposed Action. Other alternatives, which included different locations, were considered to determine whether they could operationally accomplish the proposed beddown. All three action alternatives involved renovation of existing facilities and some new construction within already developed areas. The alternatives considered but not carried forward are described in Section 2.2.

Under the proposed beddown, traditional and full-time ANG positions would shift within the Anchorage area from Kulis ANGB to Elmendorf AFB. This shift would include approximately 340 full-time and 800 traditional ANG personnel.

A variety of ancillary ANG functions would be assumed by existing Air Force facilities as a part of 176 WG relocating to Elmendorf AFB. These functions would still be performed by 176 WG personnel co-located in existing Air Force facilities. These Force Integration Areas shared by active duty and ANG include:

- Public Affairs
- Command Post
- Equal Employment Opportunity Office
- Traffic Management Office
- Service Squadron

Efficiencies gained by integrating these functions would reinforce active duty/guard association development and save DoD financial resources through so-called "zero cost integration" of functions. Through the siting process it was impossible not to disperse some Guard functions while employing zero cost integration. Consideration was given to finding an acceptable balance between cost efficiency gains and effects on Guard unit cohesion.

2.1.1 Proposed Action Facilities and Siting

The Proposed Action would consolidate all 176 WG aircraft operations, maintenance, and command functions to an area to the north side of the Runway 06/24 or the east-west runway (Figure 2.1-1). Additional facility upgrade and renovation projects would occur in five other buildings within the developed portion of the base as well as new construction of a security forces complex. Most projects would occur within the period from Fiscal Year (FY) 2008 to FY2011. Total estimated cost of implementation of this Proposed Action would be $160 million.

A total of 22 projects would occur as presented in Table 2.1-1. Of these, twelve would be new construction projects resulting in a total of 215,460 square feet of new facility space. The remainder of the facilities projects would involve the renovation of existing structures. Development of a new parking apron for C-130 aircraft would require approximately 7.6 acres. Construction, renovation, and infrastructure upgrades associated with the Proposed Action would affect a total area of approximately 21 acres within the developed portion of Elmendorf AFB. This area includes building and construction footprints, new walkways, landscaping, and new paved surfaces as well as the area of disturbance required to connect facilities to existing infrastructure such as sewer, water, electricity, and heat.

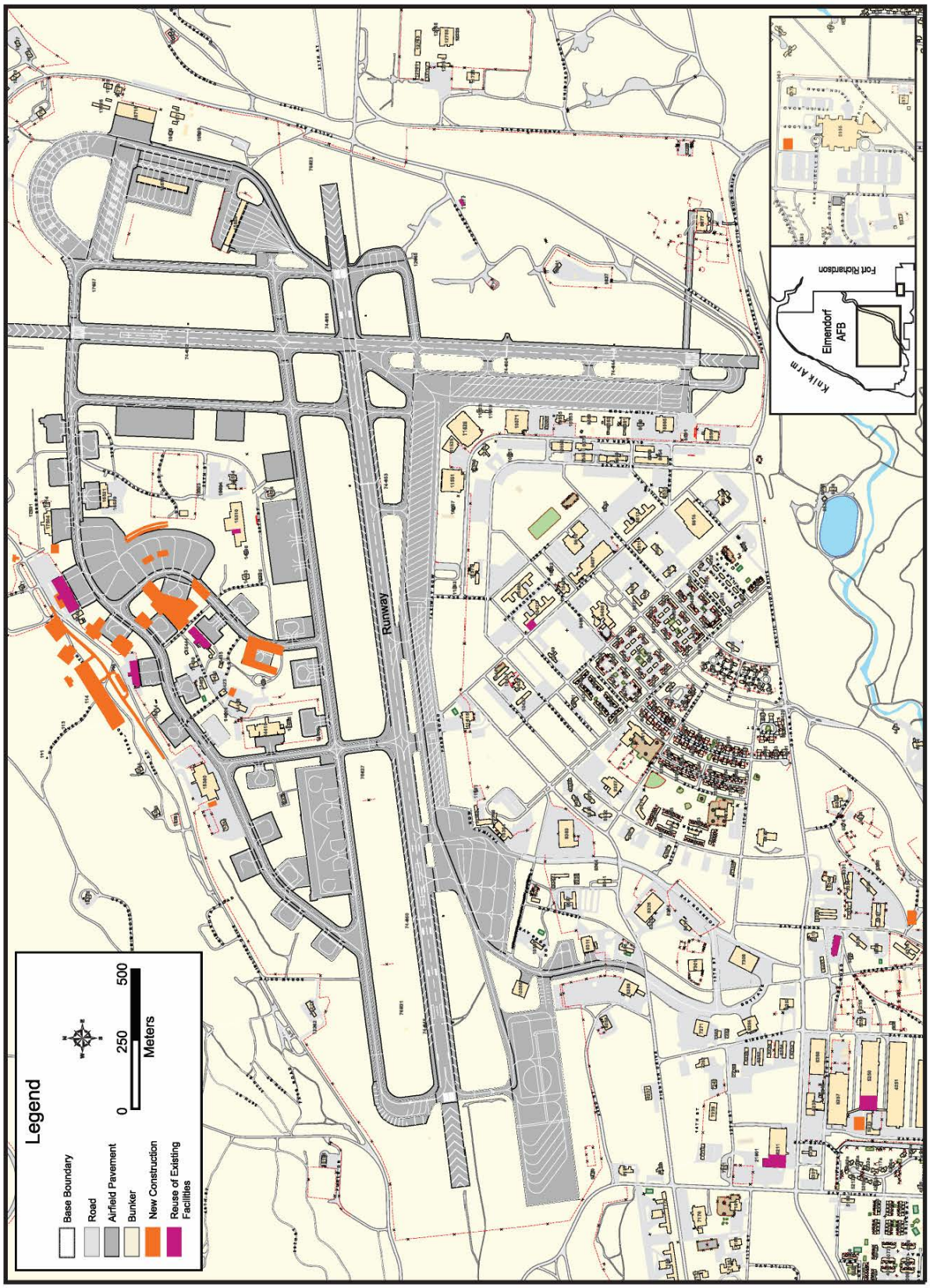


Figure 2.1-1. Proposed Action Facilities and Siting

Table 2.1-1. Proposed Action Projects

Project Name	*Building Square Feet*
FY2007 Projects	
Aircraft Park Apron – Phase I	
Construct Infrastructure and Utilities for C-130 Aircraft	
Engine Storage Facility (for C-17 to replace C-130 use of Hangar 18)	10,000
FY2008 Projects	
Aircraft Maintenance Complex	47,300
Pararescue Operations Complex	43,200
Alter Alert Helicopter Hangar (Building 16430/Hangar 11 - Renovations)	32,091
Alter Helicopter Maintenance Hangar 10/Forward Supply Point (Building 15455/Hangar 10 - Renovations)	32,831
FY2009 Projects	
Security Forces Squadron/Combat Arms Training Maintenance (CATM) (Building 4309 – New Construction)	2,400
Civil Engineer Squadron (Building 5312 - Renovations)	15,085
Logistics Readiness Squadron (LRS)/Vehicle Maintenance Flight (Building 6211 - Renovations)	16,040
Security Forces Complex (Building 7252 – Renovations)	11,500
Communications Flight (Building 10471 – Renovations)	10,600
LRS/Fuels Management Flight (Building 11673 – Renovations)	1,785
Aerial Port Flight (Building 15380 – New Construction)	5,900
Aircraft Support Equipment (Building 15431 – New Construction)	7,000
LRS/Base Supply (Building 4251 - Renovations)	17,500
Combat Readiness and Resources Flight and Wing Plans (Building 15510 – Renovations)	975
Operations Group (Building 17470 or Hangar 18 – New Construction)	15,759
Operations Group and Maintenance Alter (Building 17470/Hangar 18 - Renovations)	43,691
Medical Group – New Construction	10,000
Wing Operations and Training Facility – New Construction	18,700
LRS Administrative – New Construction	7,100
Training Fire Station – New Construction	3,700
Corrosion Control/Fuel Cell Hangar – New Construction	44,400
FY2010 Projects	
C-130 Aircraft Parking Apron – Phase II	

As part of the Proposed Action infrastructure and utilities projects, a segment of Airlifter Drive would be realigned to the north. This would straighten the road and open up level airfield space for future development in the vicinity of Hangar 11. In conjunction with this portion of the project, some development would occur to the north of the new alignment at the base of the Elmendorf Moraine upslope. Proposed development in this area includes two small structures, a new parking area, and the paving of an existing gravel parking area.

The Proposed Action would support the development of a 176 WG Area of Operations to the north side of Elmendorf AFB's east-west runway. Airlift and search and rescue missions would be consolidated and headquartered in this portion of the base. HH-60G Pave Hawk operations would be established and consolidated on the western side of the new operations area in proximity to Hangar 11 and immediately adjacent to C-130 operations. The C-130 area would be contiguous with, but not overlap the helicopter area. The new AKANG operations area would operate in association with the new C-17 capability at Elmendorf and complement its heavy airlift mission. 176 WG AKANG inventory aircraft and equipment would form the basis for reverse association with active duty Air Force. The Proposed Action meets the goal of consolidating manpower and resources in a 176 WG Area of Operations to achieve efficient maintenance and operations of the 176 WG.

2.2 Alternatives Considered But Not Carried Forward

2.2.1 Across Runway Alternative

This alternative would locate C-130 aircraft in the area north of the Runway 06/24 as described for the Proposed Action. Under this alternative, HH-60G helicopter beddown and support facilities would be located to the south of the east-west runway across the runway from the C-130 aircraft. The location would be south of the intersection of Runway 06/24 and Runway 16/34. New helicopter support facilities would need to be established through extensive renovation of Hangar 3 located to the west of Runway 16/34 (the north-south runway) and adjacent to facilities and aprons scheduled to support F-22A aircraft. Force integration areas would be as described for the Proposed Action. Projects considered for development as part of the Across Runway Alternative are listed in Appendix B.

Downdraft from rotary wing aircraft, such as HH-60Gs, can generate considerable flying object debris (FOD) harmful to the engine and flight surfaces of high performance fighter aircraft. Additionally, this downdraft foils critical snow removal efforts of fighter aircraft parking aprons and taxi lanes. Increased FOD risk to F-22A aircraft scheduled to beddown in 2011 is sufficient to exclude the Across the Runway Alternative from further consideration.

The Across Runway Alternative would meet infrastructure requirements but presented operational constraints affecting mission readiness and safety. Developing Hangar 3 as a helicopter support center would create potential FOD that could be ingested into fixed-wing fighter aircraft engines operating in close proximity. Separation of C-130 and HH-60G functions would increase response time during search and rescue missions. In addition, force separation would impair unit cohesion.

Additionally, this alternative would operationally divide 176 WG functions and would create additional operational command and control requirements which would interfere with efficient use of personnel and equipment. Many of these capabilities are used on both C-130 and HH-60G aircraft. It would require personnel to travel entirely around the airfield to perform required activities on the separated aircraft. This would not achieve the goal of consolidating manpower and resources to achieve efficient maintenance and operations. This is an alternative considered but not carried forward as a viable operational alternative for this EA.

2.2.2 Fort Richardson Alternative

Under the Fort Richardson Alternative, fixed-wing facilities to support C-130 aircraft would be configured similar to the Proposed Action, but HH-60G Pave Hawk helicopters would beddown at Bryant Field Fort Richardson to the northeast of Elmendorf AFB (see Figure 1.1-1). Extensive runway facility upgrades and Instrument Flight Rules (IFRs) support equipment installation would be required. This alternative would distribute operations and maintenance personnel at two locations. Dedicated search and rescue helicopter infrastructure would not be configured at Elmendorf in association with other ANG elements. Projects considered for development as part of the Fort Richardson Alternative are listed in Appendix B.

The Fort Richardson Alternative would not meet infrastructure requirements, presents operational constraints, and challenges the 176 WG's ability to comply with BRAC directives. Like the Across the Runway Alternative, this alternative presented a spatial separation of C-130 and HH-60G functions that would result in increased response time during emergencies. Placing helicopters at a site off Elmendorf AFB would not only create unit cohesion problems within the 176 WG, but would also negate the BRAC directive for reverse association development. This is an alternative considered but not carried forward as a viable alternative for this EA.

2.3 No Action Alternative

NEPA requires the identification and analysis of a No Action Alternative. Under the No Action Alternative, the 176 WG would not beddown at Elmendorf AFB. The result of the No Action alternative would be:

- No reverse association, resulting in loss of medium lift mission.
- No ability of active duty and ANG to share airfield elements.
- Failure to advance the Air Force's directive for the formation of ANG/active duty associations.
- Failure to comply with BRAC 2005 commission recommendations.

2.4 Environmental Impact Analysis Process

This EA for the 176 WG beddown at Elmendorf AFB has been prepared in accordance with NEPA (42 United States Code [USC] 4321-4347), CEQ Regulations (40 CFR § 1500-1508), and 32 CFR 989, *et seq*., *Environmental Impact Analysis Process* (Air Force Instruction [AFI] 32-7061). NEPA is the basic national requirement for identifying environmental consequences of federal decisions. NEPA ensures that environmental information is available to the public, agencies, and the decision-maker before decisions are made and before actions are taken.

The environmental analysis process, in compliance with NEPA guidance, includes public and agency review of this analysis of the Proposed Action and the No Action Alternative. This EA provides a full and fair discussion of potential consequences to the natural and human environment. Interagency and Intergovernmental Coordination for Environmental Planning (IICEP) letters were sent and responses received through June 2007.

2.4.1 EA Organization

This EA is organized into the following chapters and appendices. Chapter 1.0 describes the purpose and need of the proposal to beddown the 176 WG, its associated aircraft and support elements at Elmendorf AFB. A detailed description of the Proposed Action and the No Action Alternative is provided in Chapter 2.0. Chapter 2.0 also provides a comparative summary of the potential effects of the Proposed Action and No Action Alternative with respect to the various environmental resources. Chapter 3.0 describes the existing conditions within the area potentially affected by the Proposed Action at Elmendorf AFB. Chapter 4.0 describes the environmental consequences of the Proposed Action and the No Action Alternative. Chapter 5.0 presents a cumulative analysis, considers the relationship between short-term uses and long-term productivity identified for the resources affected, and summarizes the irreversible and irretrievable commitment of resources if the Proposed Action were implemented. Chapter 6.0 contains references cited in the EA and lists the individuals and organizations contacted during the preparation of the EA. A list of the document preparers is included in Chapter 7.0. The following appendices are included in this document: Appendix A, Base Realignment and Closure 2005 and National Environmental Policy Act Considerations; Appendix B, Projects Associated With Alternatives Considered But Not Carried Forward; Appendix C, Agency Coordination; and Appendix D, Aircraft Noise Analysis.

2.4.2 Scope of Resource Analysis

The Proposed Action has the potential to affect certain environmental resources. These potentially affected resources have been identified through communications with state and federal agencies and Alaska Natives and review of past environmental documentation. Specific environmental resources associated with Elmendorf AFB with the potential for environmental consequences considered in this EA include airspace management and air traffic control (including airport traffic), noise, safety, air quality, physical resources, biological resources, cultural resources, land use, transportation, socioeconomics, and environmental justice.

Training missions associated with the 176 WG at Elmendorf AFB would be equivalent to those currently conducted from Kulis ANGB or those previously conducted by Elmendorf-based C-130 aircraft. Training missions are conducted in existing Alaskan airspace. No changes to Alaskan airspace or changes to training within Alaskan airspace are included in the Proposed Action. No environmental resources within or under the airspace would be expected to be affected as a result of a relocation of aircraft, personnel, and equipment from Kulis ANGB to Elmendorf AFB.

2.4.3 Public and Agency Involvement

The Air Force initiated early public and agency involvement in the environmental analysis of the proposed beddown. The Air Force published newspaper notices and distributed IICEP letters. These announcements solicited public and agency input on the project. The newspaper notice of intent to prepare the Draft EA was published in the Elmendorf AFB Sourdough Sentinel on May 11, 2007 and in the Anchorage Daily News on May 18, 2007. The newspaper display ad announcing the availability of the Draft EA was published in the Sourdough Sentinel on July 27, 2007 and in the Anchorage Daily News on July 24, 2007.

2.5 Regulatory Compliance

This EA has been prepared to satisfy the requirements of NEPA (Public Law [P.L.] 91-190, 42 USC 4321 *et seq*.) as amended in 1975 by P.L. 94-52 and P.L. 94-83. The intent of NEPA is to protect, restore, and enhance the environment through well-informed federal decisions. In addition, this document was prepared in accordance with Section 102 (2) of NEPA, regulations established by the CEQ (40 CFR 1500-1508), and AFI 32-7061 (i.e., 32 CFR Part 989).

Certain areas of federal legislation, such as the Endangered Species Act (ESA) and National Historic Preservation Act (NHPA), have been given special consideration in this EA. Implementation of the proposed beddown at Elmendorf AFB may require various federal and state reviews and permits, and coordination with several agencies. Copies of the Draft EA are provided to applicable state and federal agencies for review.

Compliance with the ESA requires communication with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration National Marine Fisheries Service in cases where a federal action could affect listed threatened or endangered species, species proposed for listing, or candidates for listing. The primary focus of this consultation is to request a determination of whether any of these species occur in the proposal area. If any of these species is present, a determination is made of any potential adverse effects on the species. Should no species protected by the ESA be affected by the Proposed Action, no additional action is required. Letters were sent to the National Oceanic and Atmospheric Administration National Marine Fisheries Service and USFWS as well as state agencies, informing them of the proposal and requesting data regarding applicable protected species. A review of USFWS data revealed that there are no federally listed or proposed species and/or designated or proposed critical habitat within the action area of the proposed project. A copy of the Draft EA was sent to USFWS for review and comment of the proposed project. Appendix C includes copies of relevant coordination letters sent by the Air Force.

The preservation of Alaska Native cultural resources is coordinated by the State Historic Preservation Office (SHPO), as mandated by the NHPA and its implementing regulations. Letters were sent to potentially affected Alaska Native communities informing them of the proposal (Appendix C).

Federal lands are excluded from coastal zone boundaries. However, all uses and activities that directly affect the coastal area must be consistent to the maximum extent practical with the Alaska Coastal Management Program and they are subject to the consistency provisions of

Section 307 of the Coastal Zone Management Act of 1972, as amended (16 USC 1451 *et seq.*). The Proposed Action option locations are not within the 150 acres of shoreline that are within the coastal zone boundary managed by Elmendorf AFB.

Elmendorf AFB is in attainment for all criteria pollutants and therefore an Air Conformity Review under the Clean Air Act (CAA) Amendments is not required as emissions for air pollutants is below the *de minimis* threshold. Elmendorf AFB will work with the Alaska Department of Environmental Conservation to prepare a permit to construct and operate new stationary sources. Elmendorf AFB will prepare a pollution discharge elimination system permit and a construction Storm Water Pollution Prevention Plan (SWPPP).

2.6 Environmental Comparison of the Proposed Action and No Action Alternative

Table 2.6-1 summarizes the potential environmental consequences of implementing the Proposed Action or the No Action Alternative. Chapter 5.0 considers cumulative consequences and finds that there are no significant cumulative environmental consequences resulting from beddown of the 176 WG at Elmendorf AFB when added to other past, present, or reasonably foreseeable future federal and non-federal actions.

Table 2.6-1. Summary of Potential Environmental Consequences
(Page 1 of 3)

	Proposed Action	*No Action Alternative*
Airspace Management and Air Traffic Control	Beddown would not result in modification of Elmendorf Tower or Anchorage Alaska Terminal Area (AATA) procedures. Sortie operations of the 176 WG expected to result in no significant contribution to Elmendorf's operational capacity. Aircraft with the 176 WG proposed to operate within the same airspace.	No beddown combined with recent departure of Air Force C-130 aircraft would result in a decrease in airfield operations below baseline.
Noise	No change in noise contours or sound levels beyond those for currently scheduled aircraft. Short-term construction noise. No impacts expected.	Noise contours would be similar to those for currently scheduled aircraft. No impacts expected.
Safety	C-130 is a proven airframe with one of the lowest Class A mishap rates in the Air Force inventory. HH-60G aircraft are also proven airframes. No impacts to ground safety or clear zones (CZs) or accident potential zones (APZs) expected. Beddown of currently scheduled aircraft and 176 WG will require new or updated Air Installation Compatible Use Zone (AICUZ) analysis once aircraft arrive at Elmendorf AFB. Identification of an additional helicopter clear zone. Explosive safety to remain the same. Facility modernization would improve fire detection and suppression capability and reduce some physical hazards.	Safety would remain the same.
Air Quality	Combustion engines and fugitive dust emissions would produce localized, short-term elevated air pollutant concentrations, which would not result in any long-term impacts on the air quality. Facility expansion may result in minor increases in emissions. New facilities may require new on-site generators, increasing emissions. Renovation and modernization of aging facilities would result in increased power use efficiency and decrease some emissions. All appropriate construction and operation permits would be obtained. The beddown would not result in an increase in aircraft currently operating within the Anchorage area. No pollutants expected to exceed threshold for Elmendorf or Anchorage area. No adverse impacts to air quality or visibility expected.	Air quality would remain in attainment for all criteria pollutants.
Physical Resources (including hazardous materials and waste management)	No construction projects are sited in wetlands, floodplains, or areas prone to permafrost. Increase in impervious surface not expected to affect runoff or recharge. The site-specific SWPPP would be reviewed for each construction project. Only those projects affecting 1 acre or more would need to have an SWPPP developed. Generation of waste consistent with normal base activity. Asbestos and lead-based paint waste	Physical resources (including hazardous materials and waste management) would remain. Some infrastructure projects would be developed under separate actions. Some hazardous materials would not be removed from buildings; some contaminated soils would not be excavated

Table 2.6-1. Summary of Potential Environmental Consequences
(Page 2 of 3)

	Proposed Action	*No Action Alternative*
Physical Resources (including hazardous materials and waste management) (continued)	would be generated during some renovations and building expansions; removal during renovation projects would reduce exposure pathways for personnel. The proposed construction and renovation are sited within 200 feet of nine environmental sites. Project design and coordination with the Environmental Office prior to any construction would occur to ensure that ongoing Environmental Program remediation or investigation activities are not impaired. Excavation is likely to result in removal and disposal of contaminated soils. Applicable permits and best management practices (BMPs) would be followed; net positive impact anticipated.	and remediated. Ongoing programs would occur as planned as directed by the Environmental Program Office. No positive impacts would occur.
Biological Resources	Northern margin of project area would result in removal of some second growth forest along Airlifter Drive within a total area of 9.4 acres. Remaining development would occur in previously disturbed habitats. No undisturbed native communities or protected species present in project area.	Biological resources would remain the same; no impact expected.
Cultural Resources	One structure scheduled for renovation is eligible for the National Register of Historic Places (NRHP). The setting of one NRHP-eligible structure may be affected by new facilities construction in its vicinity. Seven buildings scheduled for renovation have not been evaluated for NRHP eligibility and are potentially eligible. As specified in the Integrated Cultural Resources Management Plan (ICRMP), compliance with Section 106 of NRHP, including State Historic Preservation Office (SHPO) consultation regarding the NRHP-eligible structures scheduled for exterior renovation and potentially affected by new facilities construction has been initiated and will be completed. Unknown subsurface archaeological resources could be impacted by ground disturbing activities; ICRMP guidelines would be followed.	Cultural resources remain the same; no impacts expected.

Table 2.6-1. Summary of Potential Environmental Consequences
(Page 3 of 3)

	Proposed Action	*No Action Alternative*
Land Use	Area affected by 65 Day-Night Average Sound Level (L_{dn}) noise levels expected to remain the same as currently projected for already scheduled aircraft. Construction and renovation projects compatible with base planning and existing land uses. Some temporary construction-related traffic congestion along Airlifter Drive thoroughfare would occur. Shift in traditional guardsmen to Elmendorf would result in increase in weekend activity and some traffic. Infrastructure expected to be improved with new or renovated buildings and resurfacing and road realignment; no adverse impact expected.	No change to land use; no impact expected.
Socioeconomics and Environmental Justice	No long-term change in base employment or expenditures. No disproportionate impact to minority and low-income populations. No noticeable impact to children.	No change in base employment or expenditures; no impact expected.

3.0 176TH WING BEDDOWN AT ELMENDORF AFB AFFECTED ENVIRONMENT

This chapter discusses the existing conditions of the affected environment under the Proposed Action at Elmendorf AFB. NEPA requires that the analysis address those areas and the components of the environment with the potential to be affected; locations and resources with no potential to be affected need not be analyzed.

Each resource discussion begins with a definition including resource attributes and any applicable regulations. The expected geographic scope of any potential consequences is identified as the Region of Influence (ROI). For most resources in this chapter, the ROI is defined as the boundaries of Elmendorf AFB. Where appropriate, the ROI extends over a larger area unique to the resource.

The existing condition of each relevant environmental resource is described to give the public and agency decision-makers a meaningful point from which they can compare potential future effects on natural and human environments. The future effects or environmental consequences of the Proposed Action and No Action Alternative as described in Chapter 2.0 and overlaid on the Chapter 3.0 Potentially Affected Environment are presented in Chapter 4.0. Cumulative effects discussed in Chapter 5.0 places the analysis in Chapter 4.0 within the great context of ongoing and reasonably foreseeable actions.

3.1 Airfield and Airspace Management

The ROI for aircraft operations at Elmendorf AFB includes the base and the airspace surrounding the airfield. This section explains airspace management within the area potentially affected by the Proposed Action.

3.1.1 Definition of the Resource

Airspace management and air traffic control is defined as the direction, control, and handling of flight operations in the "navigable airspace" that overlies the geopolitical borders of the U.S. and its territories. "Navigable airspace" is airspace above the minimum altitudes of flight prescribed by regulations under USC Title 49, Subtitle VII, Part A, and includes airspace needed to ensure safety in the takeoff and landing of aircraft, as defined in Federal Aviation Administration (FAA) Order 7400.2E (49 USC). This navigable airspace is a limited natural resource that Congress has charged the FAA to administer in the public interest as necessary to ensure the safety of aircraft and its efficient use (FAA Order 7400.2E 2000).

3.1.2 Existing Conditions

Elmendorf AFB airspace is managed in accordance with processes and procedures detailed in AFI 13-201, *Air Force Airspace Management*. AFI 13-201 implements Air Force Planning Document 13-2, *Air Traffic Control, Airspace, Airfield, and Range Management*, and DoD Directive 5030.19, *DoD Responsibilities on Federal Aviation and National Airspace System Matters*. This AFI addresses the aeronautical matters governing the efficient planning, acquisition, use, and management of airspace required to support Air Force flight operations (Air Force 2001a).

Elmendorf AFB airspace is within the Anchorage Alaska Terminal Area (AATA). The AATA is divided into six segments: the International Segment; the Seward Highway Segment; the Lake Hood Segment; the Merrill Segment; the Elmendorf Segment; and, the Bryant Segment (3 WG 2004).

Class D controlled airspace has been established around Elmendorf AFB. This controlled airspace abuts the Class C controlled airspace around Anchorage International Airport to the southwest, and the Restricted Area R-2203 over Fort Richardson to the northeast. While the Elmendorf AFB control tower manages arrivals and departures at Elmendorf AFB, Anchorage Approach Control has overall responsibility for traffic management within the AATA. Detailed processes, procedures, and altitude separation requirements that must be followed by military and civilian pilots operating within the AATA are published in aeronautical charts.

Aircraft at Elmendorf AFB have flown in this airspace for more than 60 years without conflict with civil or commercial aviation. During periods when the ATAA is congested, continued coordination between Elmendorf AFB Air Traffic Control (ATC) and Anchorage Approach Control minimizes conflicts.

3.2 Noise

3.2.1 Definition of the Resource

Noise is considered to be unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. The noise may be intermittent or continuous, steady or impulsive. Noise sources may be stationary or transient. Stationary sources are normally related to specific land uses, e.g., housing tracts or industrial plants. Transient noise sources move through the environment, either along predictable established paths (e.g., highways, railroads), or randomly (e.g., an aircraft flying within a block of training airspace.) There is wide diversity in responses to noise that not only vary according to the type of noise and the characteristics of the sound source, but also according to the sensitivity and expectations of the receptor, the time of day, and the distance between the noise source (e.g., an aircraft) and the receptor (e.g., a person or animal).

The physical characteristics of noise, or sound, include its *intensity*, *frequency*, and *duration*. Sound is created by acoustic energy, which produces minute pressure waves that travel through a medium, like air, and are sensed by the eardrum. This may be likened to the ripples in water that would be produced when a stone is dropped into it. As the acoustic energy increases, the intensity or amplitude of these pressure waves increase, and the ear senses louder noise. Sound intensity varies widely (from a soft whisper to a jet engine) and is measured on a logarithmic scale to accommodate this wide range. The use of logarithms is a mathematical tool that simplifies dealing with very large and very small numbers. For example, the logarithm of the number 1,000,000 is 6, and the logarithm of the number 0.000001 is -6 (minus 6). As more zeros

are added before or after the decimal point, converting these numbers to their logarithms greatly simplifies calculations that use these numbers.

The frequency of sound is measured in cycles per second, or hertz (Hz). This measurement reflects the number of times per second the air vibrates from the acoustic energy. Low frequency sounds are heard as rumbles or roars, and high frequency sounds are heard as screeches. Sound measurement is further refined through the use of "A-weighting." The normal human ear can detect sounds that range in frequency from about 20 Hz to 15,000 Hz. However, all sounds throughout this range are not heard equally well. Therefore, through internal electronic circuitry, some sound meters are calibrated to emphasize frequencies in the 1,000 to 4,000 Hz range. The human ear is most sensitive to frequencies in this range, and sounds measured with these instruments are termed "A-weighted," and are shown in terms of A-weighted decibels.

The duration of a noise event, and the number of times noise events occur are also important considerations in assessing noise impacts.

The word "metric" is used to describe a standard of measurement. As used in environmental noise analysis, there are many different types of noise metrics. Each metric has a different physical meaning or interpretation and each metric was developed by researchers attempting to represent the effects of environmental noise.

The metrics that support the assessment of noise from aircraft operations associated with the proposal include the maximum sound level (L_{max}), the Sound Exposure Level (SEL), and Day-Night Average Sound Levels (L_{dn}). Each metric represents a "tier" for quantifying the noise environment, and is briefly discussed below. Section 4.2.1 and Appendix B also contain noise metric definitions.

Maximum Sound Level

L_{max} defines peak noise levels. L_{max} is the highest sound level measured during a single noise event (e.g., an aircraft overflight), and is the sound actually heard by a person on the ground. For an observer, the noise level starts at the ambient noise level, rises up to the maximum level as the aircraft flies closest to the observer, and returns to the ambient level as the aircraft recedes into the distance.

Sound Exposure Level

L_{max} alone may not represent how intrusive an aircraft noise event is because it does not consider the length of time that the noise persists. The SEL metric combines both of these characteristics into a single measure. It is important to note, however, that SEL does not directly represent the sound level heard at any given time, but rather provides a measure of the total exposure of the entire event. Its value represents all of the acoustic energy associated with the event, as though it was present for one second. Therefore, for sound events that last longer than one second, the SEL value will be higher than the L_{max} value. The SEL value is important because it is the value used to calculate other time-averaged noise metrics.

Time-Averaged Cumulative Day-Night Average Noise Metrics

The number of times aircraft noise events occur during given periods is also an important consideration in assessing noise impacts. The "cumulative" noise metrics that support the analysis of multiple time-varying aircraft events are L_{dn} and the Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}).

These metrics sum the individual noise events and average the resulting level over a specified length of time. Thus, it is a composite metric representing the maximum noise levels, the duration of the events, the number of events that occur, and the time of day during which they occur. These metrics add a 10 decibel (dB) penalty to those events that occur between 10:00 p.m. and 7:00 a.m. to account for the increased intrusiveness of noise events that occur at night when ambient noise levels are normally lower than during the daytime. These cumulative metric do not represent the variations in the sound level heard. Nevertheless, they do provide an excellent measure for comparing environmental noise exposures when there are multiple noise events to be considered.

Using measured sound levels as a basis, the Air Force developed several computer programs to calculate noise levels resulting from aircraft operations. Sound levels calculated by these programs have been extensively validated against measured data, and have been proven to be highly accurate.

In this document, the sound levels calculated for aircraft operations around Elmendorf AFB are all daily L_{dn}. L_{dn} metrics are the preferred noise metrics of the Department of Housing and Urban Development, the U.S. Department of Transportation, the FAA, the U.S. Environmental Protection Agency (USEPA), and the Veteran's Administration.

L_{dn} may be thought of as the continuous or cumulative A-weighted sound level which would be present if all of the variations in sound level which occur over the given period were smoothed out so as to contain the same total sound energy. While L_{dn} does provide a single measure of overall noise impact, it is fully recognized that it does not provide specific information on the number of noise events or the specific individual sound levels which do occur. For example, an L_{dn} of 65 dB could result from a very few noisy events, or a large number of less noisy events. Although it does not represent the sound level heard at any one particular time, it does represent the total sound exposure. Scientific studies and social surveys have found the L_{dn} to be the best measure to assess levels of community annoyance associated with all types of environmental noise. Therefore, its use is endorsed by the scientific community and governmental agencies (American National Standards Institute 1980, 1988; USEPA 1974; Federal Interagency Commission on Urban Noise 1980; Federal Interagency Commission on Noise 1992).

The ROI for noise consists of the area immediately surrounding Elmendorf AFB, as identified by the L_{dn} 65 noise contour.

3.2.2 Existing Conditions

Elmendorf AFB has supported a variety of aircraft and operations since its beginnings in the early 1940s. Aircraft and associated missions have ranged from World War II bombers and cargo aircraft to the current suite of 42 Primary Aircraft Inventory (PAI) F-15Cs, 2 E-3s, and 3 C-12s. Elmendorf is a dynamic base with regular mission and aircraft changes. The F-15Cs are scheduled to be replaced by F-22A, the C-130Hs have recently departed; C-17s are scheduled to be based at Elmendorf AFB (Air Force 2004a, 2006a). The variety of missions and aircraft over the years has formed the shape and extent of areas affected by aircraft operations and associated noise.

Baseline noise levels, expressed as L_{dn}, were modeled based on aircraft types, runway use patterns, engine power settings, altitude profiles, flight track locations, airspeed, and other factors. To identify the areas affected by noise levels around the base, the Air Force's

NOISEMAP program is used to calculate noise levels and generate noise contours. Then, the Air Force's NMPlot program is used to graphically plot these contours on a background map in 5 dB increments from 65 L_{dn} to 85 L_{dn}. In keeping with Elmendorf AFB noise abatement programs, no sorties by fighter aircraft are assumed to occur between 10 p.m. and 7 a.m. for normal training activity. The most recent noise modeling conducted for Elmendorf AFB includes the beddown of two squadrons of F-22A aircraft (18 PAI each) scheduled to occur by 2011, the C-17s and the C-130s for an effective cumulative analysis. This analysis most accurately represents baseline conditions projected for Elmendorf AFB. Noise level contours associated with scheduled aircraft are depicted on Figure 3.2-1. These noise level contours reflect baseline conditions with active duty C-130s with the 517 AS; however active duty C-130s have relocated under a separate action. Table 3.2-1 presents the baseline averages exposed to varying noise levels under the scheduled Elmendorf AFB aircraft.

Table 3.2-1. Land Area Noise Exposures Under Baseline Conditions

Location	*Condition*	GEOGRAPHIC AREA (IN ACRES) EXPOSED TO INDICATED NOISE LEVELS (IN L_{DN})					
		65-70	***70-75***	***75-80***	***80-85***	***>85***	***Total***
Elmendorf AFB	Baseline	4,161.3	2,072.1	1,205.6	516.8	563.4	8,519.2
Fort Richardson	Baseline	1,151.6	136.7	0	0	0	1,288.4
Over Water	Baseline	1,173.5	188.6	7.7	0	0	1,369.8
Port of Anchorage	Baseline	29.4	11.1	0.5	0	0	41.0
Port MacKenzie Area	Baseline	23.5	0	0	0	0	23.5

Source: Wasmer and Maunsell 2005.

Aircraft at Elmendorf AFB generally operate according to established flight paths and overfly the same areas surrounding the base. Military aircraft are designed for performance and the engines are noisy. Elmendorf AFB employs a quiet-hours program in which, barring mission-related or national security emergencies or large-force exercises, jet fighter aircraft operations (take off and landing patterns as well as engine run-ups) are avoided after 10:00 p.m. and before 7:00 a.m. every day of the week. At Elmendorf AFB, noise exposure from airfield operations typically occur beneath main approach and departure corridors along both runways and in areas immediately adjacent to parking ramps and aircraft staging areas.

Noise due to construction and maintenance equipment, as well as general vehicle traffic is a common, ongoing occurrence in the base environment. Existing military construction (MILCON) projects are currently in progress at Elmendorf AFB. Trucks, as well as heavy equipment, are usually found in the base environment on a daily basis to support these existing facility and infrastructure upgrades.

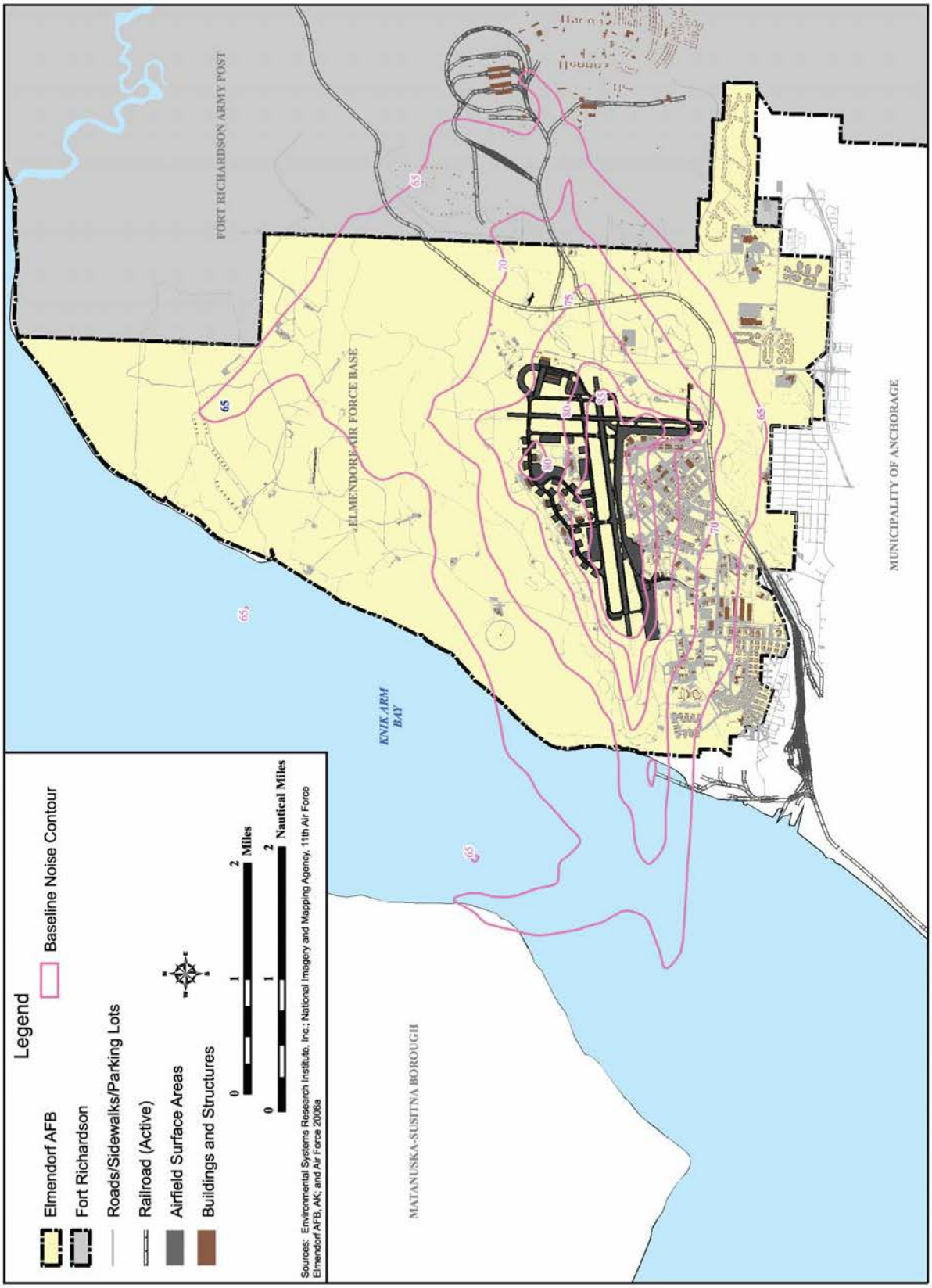


Figure 3.2-1. Baseline Noise Contours

3.3 Safety

3.3.1 Definition of the Resource

This section addresses ground, flight, and explosive safety associated with operations conducted by the 3 WG at Elmendorf AFB. These operations include activities and operations conducted on the base itself, as well as training conducted in regional military training airspace. Ground safety considers issues associated with operations and maintenance activities that support base operations, including fire response. Flight safety considers aircraft flight risks. Explosive safety discusses the management and use of ordnance or munitions associated with airbase operations and training activities conducted in various elements of training airspace. The safety ROI includes Elmendorf AFB and environs. Regarding the 176 WG mission for search and rescue, safety also includes a broader regional safety support activity.

3.3.2 Existing Conditions

3.3.2.1 Ground Safety

Ongoing operations and maintenance activities conducted by the 3 WG are performed in accordance with applicable Air Force safety regulations, published Air Force Technical Orders, and standards prescribed by Air Force Occupational Safety and Health requirements. In 2005, the 3 WG experienced a Ground Operations fatality. While performing maintenance on an F-15 aircraft, a technician went to pick up a canopy safety strut, and fell from the maintenance platform to the hangar floor (personal communication, Madara 2005).

The 3 WG fire department provides fire and crash response at both Elmendorf AFB and adjacent to Fort Richardson. The unit has a sufficient number of trained and qualified personnel, and possesses all equipment necessary to respond to aircraft accidents and structure fires. There are no response-equipment shortfalls. There are several facilities, including aircraft hangars, which have documented fire safety deficiencies. These deficiencies primarily involve the need to either install or upgrade fire suppression systems (personal communication, Madara 2005).

To minimize the results of a potential accident involving aircraft operating from Elmendorf AFB, Clear Zones (CZs), Accident Potential Zones (APZs), and safety zones have been established around the airfield. In developing these zones, Elmendorf AFB is considered to have a Class B runway. These zones, from the 2005 Base General Plan, are shown in Figure 3.3-1 . Within clear and safety zones, construction is either prohibited (CZs) or limited in terms of placement and height (safety zones). Areas around the airfield where experience has shown most aircraft accidents occur are designated as APZs.

The CZ is an area 3,000 feet wide by 3,000 feet long for both Class A and Class B runways, and is located at the immediate end of the runway. The accident potential in this area is so high that no building is allowed. For safety reasons, the military is authorized to purchase the land for these areas if not already part of the installation (U.S. Army Corps of Engineers [USACE] 2001).

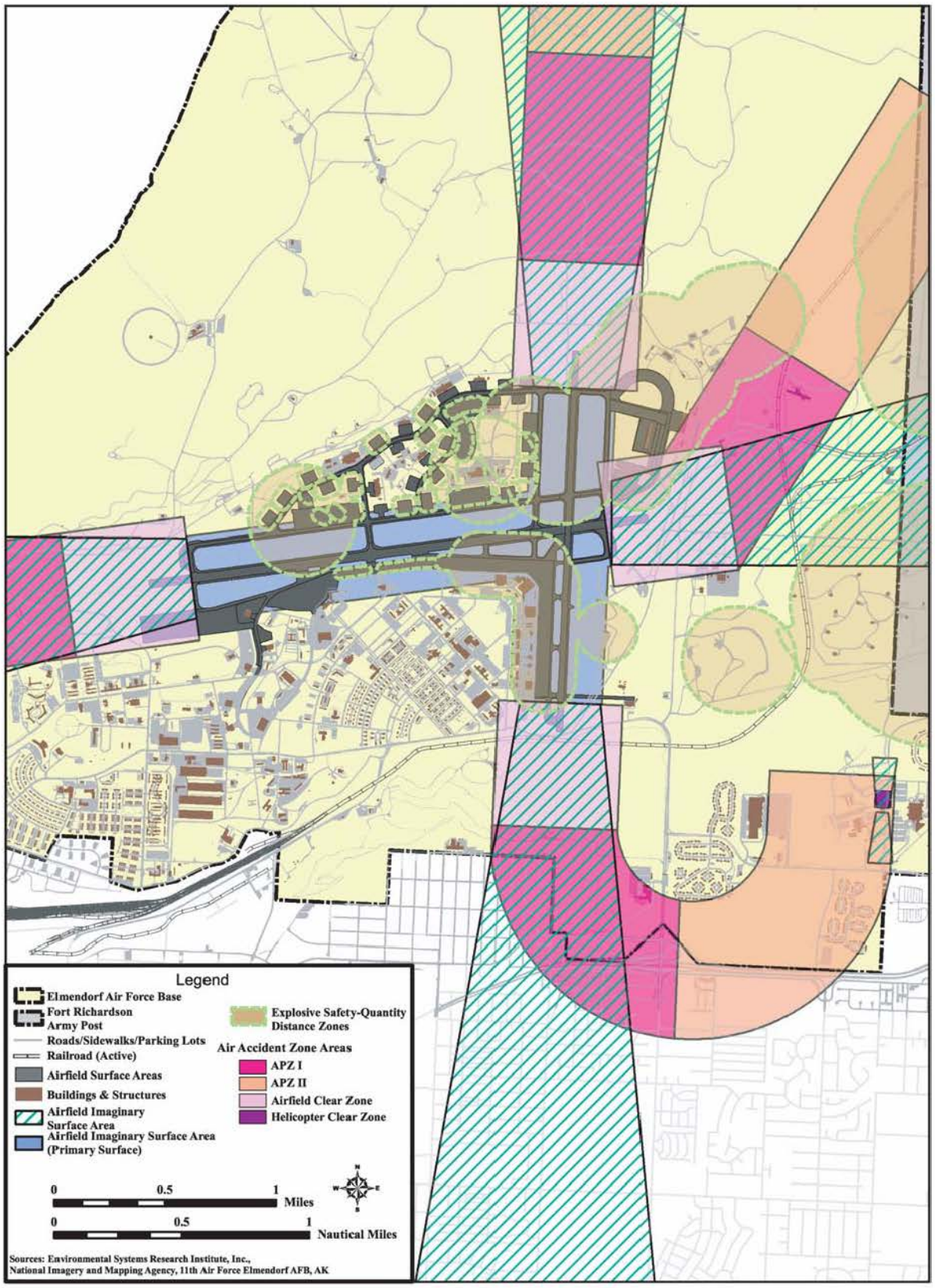


Figure 3.3-1. Elmendorf AFB Clear Zones and Accident Potential Zones

APZ I is less critical than the CZ, but still poses significant potential for accidents. This 3,000-foot wide by 5,000 foot-long area located just beyond the CZ, has land use compatibility guidelines that allow a variety of industrial, manufacturing, transportation, communication, utilities, wholesale trade, open space and agricultural uses. Uses that concentrate people in small areas are not compatible (USACE 2001).

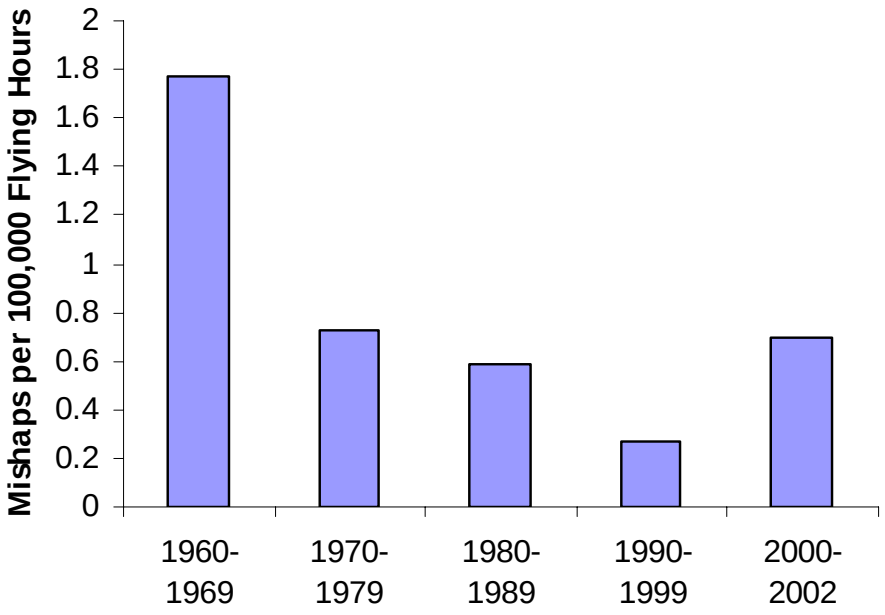
APZ II is less critical than APZ I, but still poses potential for accidents. APZ II is 3,000 feet wide and extends 7,000 feet beyond APZ I. Compatible land uses include those of APZ I, as well as low density single family residential, and those personal and business services and commercial retail trade uses with low intensity or scale of operation. High density functions such as multistory buildings, places of assembly (e.g., theaters, schools, churches and restaurants) are not considered compatible (USACE 2001).
Unified Facilities Criteria 3-260-01 also specifies requirements for imaginary surfaces on and around the runway. These criteria specify encroachment-free standards along and on either side of the runway (USACE 2001). Currently, Elmendorf AFB is operating under 29 waivers, 21 exemptions, and 6 permissible deviations to these criteria.

3.3.2.2 Flight Safety

The primary public concern with regard to flight safety is the potential for aircraft accidents. Such mishaps may occur as a result of weather-related accidents, mechanical failure, pilot error, mid-air collisions, collisions with manmade structures or terrain, or bird-aircraft collisions. Flight risks apply to all aircraft; they are not limited to the military.

The Air Force defines four major categories of aircraft mishaps: Classes A, B, C, and E, which includes High Accident Potential (HAP). Class A mishaps result in a loss of life, permanent total disability, a total cost in excess of $1 million, or destruction of an aircraft. Class B mishaps result in total costs of more than $200,000, but less than $1 million, in permanent partial disability or inpatient hospitalization of three or more personnel. Class C mishaps involve reportable damage of more than $20,000, but less than $200,000; an injury resulting in any loss of time from work beyond the day or shift on which it occurred, or occupational illness that causes loss of time from work at any time; or an occupational injury or illness resulting in permanent change of job. HAP events are any hazardous occurrence that has a high potential for becoming a mishap. Class C mishaps and HAP, the most common types of accidents, generally involve minor damage and injuries and rarely affect property or the public (Air Force 2004b). Class A mishaps are discussed because of their potentially catastrophic results.

Based on historical data on mishaps at all installations, and under all conditions of flight, the military services calculate Class A mishap rates per 100,000 flying hours for each type of aircraft in the inventory. It should be noted that these mishap rates do not consider combat losses due to enemy action. The actual causes of mishaps are due to many factors, not simply the amount of flying time of the aircraft. Mishap rates are statistically assessed as an occurrence rate per 100,000 flying hours. C-130 aircraft have been in service since 1956; they have a mishap rate of 0.99 Class A mishaps/100,000 hours. Figure 3.3-2 reflects the Class A mishap rates of the C-130 aircraft.



Source: Nullmeyer *et al.* n.d.

Figure 3.3-2. C-130 Class A Mishap Rates 1960-2002

The Sikorsky H-60, from which the Pave Hawk helicopter was developed, has been in service since 1982. Since entering the Air Force inventory, these aircraft have flown more than 430,700 hours, and have experienced 18 Class A mishaps. This results in a Class A mishap rate per 100,000 flight hours of 4.18. Of these 18 mishaps, 11 aircraft were destroyed (personal communication, Young 2007).

3.3.2.3 Aircraft Mishaps

The C-130 has over 14,400,000 flying hours recorded. Since 1971, the Air Force has experienced 63 C-130 Class A mishaps resulting in the loss of 54 aircraft. The cumulative Class A mishap rate for the C-130 is 0.99 per 100,000 flying hours. The C-130 has followed the Air Force trend of fewer mishaps per flying hour over the years (Federation of American Scientists 1998).

Considering all operations at Elmendorf AFB, in more than 25 years there have been three Class A mishaps in the vicinity of the installation. Two were flight-related; one was non-flight-related. In 1995, an E-3 aircraft encountered a large flight of birds during takeoff. Birds were ingested into all engines resulting in a complete loss of power, and the aircraft crashed. In 2000, an aero club Cessna 152 departed controlled flight during a closed pattern, and crashed. In 1998, during engine shut down, a foreign object was ingested into the left engine of an F-15C while on the parking ramp. The aircraft did not crash although the dollar value of damages resulting from this incident required classification as a Class A mishap (personal communication, Jennings 2005).

3.3.2.4 Wildlife Strike Hazard

Bird-aircraft strikes constitute a safety concern because they can result in damage to aircraft or injury to aircrews or local human populations if an aircraft crashes. Aircraft may encounter birds at altitudes up to 30,000 feet above mean sea level (MSL) or higher. However, most birds fly close to the ground. More than 97 percent of reported bird strikes occur below 3,000 feet above ground level (AGL). Approximately 30 percent of bird strikes happen in the airport environment, and almost 55 percent occur during low-altitude flight training (Air Force Safety Center [AFSC] 2002). The potential for bird-aircraft strikes is greatest in areas used as migration corridors (flyways) or where birds congregate for foraging or resting (e.g., open water bodies, rivers, and wetlands).

Migratory waterfowl (e.g., ducks, geese, and swans) are the most hazardous birds to low-flying aircraft because of their size and their propensity for migrating in large flocks at a variety of elevations and times of day. Waterfowl vary considerably in size, from 1 to 2 pounds for ducks, 5 to 8 pounds for geese, and up to 20 pounds for most swans. There are two normal migratory seasons, fall and spring. Waterfowl are usually only a hazard during migratory seasons. These birds typically migrate at night, but also take advantage of optimal daytime migration weather and generally fly between 1,000 to 4,000 feet AGL during migration (personal communication, Griese 2007).

In addition to waterfowl, raptors, shorebirds, gulls, songbirds, and other birds also pose a hazard. In considering severity, the results of bird-aircraft strikes in restricted areas show that strikes involving raptors result in the majority of Class A and Class B mishaps related to bird-aircraft strikes. Raptors of greatest concern in the ROI are eagles and hawks. In Alaska, peak migration periods for waterfowl and raptors are from August to October and from April to May. A few bald eagles winter in the vicinity of Elmendorf AFB. In general, flights above 2,000 to 3,000 feet AGL would be above most migrating and wintering raptors.

Songbirds are small birds, usually less than one pound. During nocturnal migration periods, they navigate along major rivers, typically between 500 to 3,000 feet AGL.

While any bird-aircraft strike has the potential to be serious, many result in little or no damage to the aircraft, and only a minute portion result in a Class A mishap. During the years 1985 to 2004, the Air Force Bird-Aircraft Strike Hazard (BASH) Team documented 59,156 bird strikes worldwide. Of these, 25 resulted in Class A mishaps where the aircraft was destroyed. These Air Force occurrences constituted approximately 0.04 percent of all worldwide reported bird-aircraft strikes (AFSC 2004).

The 3 WG has developed aggressive procedures designed to minimize the occurrence of bird-aircraft strikes. The unit has documented detailed procedures to monitor and react to heightened risk of bird-strikes (Elmendorf AFB 2003), and when risk increases, limits are placed on low altitude flight and some types of training (e.g., multiple approaches, closed pattern work, etc.) in the airport environment. Special briefings are provided to pilots whenever the potential exists for greater bird-strike sightings. Training and signs in open areas emphasize individual responsibilities and actions. Bird hazards exist on Elmendorf AFB year-round. Risk increases during spring and fall migration periods. Species of particular concern include Canada geese, swans, other waterfowl, sandhill cranes, gulls, raptors, and owls (Elmendorf AFB

2003). In the last 3 years, 3 WG aircraft have experienced approximately five bird-strikes per year in the airfield environment (personal communication, Jennings 2005).

Other wildlife of concern to flying operations at Elmendorf AFB include moose, wolves, coyotes, fox, bears, and smaller mammals (Elmendorf AFB 2003). Aggressive habitat management, fencing (including airfield security fencing), active and passive dispersal techniques, and effective warning techniques serve to reduce the wildlife strike hazard at Elmendorf AFB (Elmendorf AFB 2003).

3.3.2.5 Explosives Safety

All activities associated with the receipt, processing, transportation, storage maintenance, and loading of munitions items is accomplished by qualified technicians in accordance with DoD and Air Force technical procedures. The 3 WG has sufficient storage facilities and space for the storage and processing of mission-required ordnance items (personal communication, Norby 2005). Elmendorf AFB currently has three explosive safety exemptions in effect. Two are associated with distance violations to taxiways. The third involves encroachment into the required Public Transportation Route distance. All three exemptions are tied to Building 18762, located north of a secondary hot cargo pad on the northeast portion of the airfield (personal communication, Knight 2007).

There are three "hot cargo" pads on the installation, which are sufficient for handling explosive cargo. The primary pad is located near the eastern end of Runway 06/24. Additionally, there are two secondary pads. One is located toward the western end of Runway 06/24; the other is located off the extreme eastern end of Runway 06/24. All of the pads are situated north of the runway.

If required, support for explosive ordnance disposal (EOD) is provided by an active duty Air Force unit stationed at Elmendorf AFB. EOD requirements at Elmendorf AFB are also supported by an EOD range on the installation (personal communication, Norby 2005).

3.3.2.6 Safety Search and Rescue Mission

The 176 WG performs search and rescue missions that cannot be replicated by other aircraft based in Anchorage. Representative of the sort of safety mission conducted by the 176 WG was the 26 July 2006 Cougar Ace ship rescue 230 miles south of the Aleutian Islands. The following presents only one example of the regular sea, mountain, remote villages, and other search and rescue operations regularly conducted by the 176 WG.

Two ANG HC-130 planes and two ANG Pave Hawk helicopters, with the ability to be refueled in flight by the HC-130s, were launched from Kulis. The ANG planes were teamed with a Coast Guard Air Station Kodiak launched HH-60 Jayhawk helicopter that needed to stop at a refueling station in Adak. The AKANG and Coast Guard aircraft crews were able to rescue all 23 crewmembers from the ship (U.S. Coast Guard 2006).

3.4 Air Quality

This section discusses air quality considerations and conditions in the area around Elmendorf AFB near Anchorage, Alaska. It addresses air quality standards, describes current air quality conditions in the region, and presents the environmental consequences to Elmendorf AFB.

3.4.1 Definition of the Resource

Federal Air Quality Standards. Air quality is determined by the type and concentration of pollutants in the atmosphere, the size and topography of the air basin, and local and regional meteorological influences. The significance of a pollutant concentration in a region or geographical area is determined by comparing it to federal and/or state ambient air quality standards. Under the authority of the CAA, the USEPA has established nationwide air quality standards to protect public health and welfare, with an adequate margin of safety.

These federal standards, known as the National Ambient Air Quality Standards (NAAQS), represent the maximum allowable atmospheric concentrations and were developed for six "criteria" pollutants: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), respirable particulate matter less than or equal to 10 micrometers in diameter (PM_{10}), sulfur dioxide (SO_2), and lead (Pb). The NAAQS are defined in terms of concentration (e.g., parts per million [ppm] or micrograms per cubic meter [$\mu g/m^3$]) determined over various periods of time (averaging periods). Short-term standards (1-hour, 8-hour, or 24-hour periods) were established for pollutants with acute health effects and may not be exceeded more than once a year. Long-term standards (annual periods) were established for pollutants with chronic health effects and may never be exceeded.

Based on measured ambient criteria pollutant data, the USEPA designates areas of the U.S. as having air quality equal to or better than the NAAQS (attainment) or worse than the NAAQS (nonattainment). Upon achieving attainment, areas are considered to be in maintenance status for a period of 10 or more years. Areas are designated as unclassifiable for a pollutant when there is insufficient ambient air quality data for the USEPA to form a basis of attainment status. For the purpose of applying air quality regulations, unclassifiable areas are treated similar to areas that are in attainment of the NAAQS.

The USEPA recently promulgated attainment designations for the newly established 8-hour O_3 standard effective as of June 15, 2004. Meanwhile, states must continue to implement existing plans developed under the 1-hour standard during the transition to the new 8-hour standard. On December 17, 2004, the USEPA designated areas as attainment or nonattainment for the newly developed standard for particulates less than 2.5 micrometers in diameter ($PM_{2.5}$), which are fine particulates that have not been previously regulated (USEPA 2005a).

State Air Quality Standards. Under the CAA, state and local agencies may establish ambient air quality standards and regulations of their own, provided that these are at least as stringent as the federal requirements. The State of Alaska has air quality standards that are identical to the federal standards. A summary of the NAAQS that apply to the proposed project area is presented in Table 3-4-1.

Table 3.4-1. National and Alaska Ambient Air Quality Standards

Air Pollutant	*Averaging Time*	NAAQS	
		Primary	*Secondary*
Carbon Monoxide (CO)	8-hour 1-hour	9 ppm (10 μg/m^3) 35 ppm (40 μg/m^3)	--- ---
Nitrogen Dioxide (NO_2)	AAM	0.053 ppm (100 μg/m^3)	0.053 ppm (100 μg/m^3)
Sulfur Dioxide (SO_2)	AAM 24-hour 3-hour	0.03 ppm (80 μg/m^3) 0.14 ppm (365 μg/m^3) ---	--- --- 0.5 ppm (1,300 μg/m^3)
Particulate Matter (PM_{10})	AAM 24-hr	50 μg/m^3 150 μg/m^3	50 μg/m^3 150 μg/m^3
Particulate Matter ($PM_{2.5}$)[1]	AAM 24-hour	15 μg/m^3 65 μg/m^3	15 μg/m^3 65 μg/m^3
Ozone (O_3)[2]	8-hour	0.08 ppm	0.08 ppm
Lead (Pb) & Lead Compounds	3-month	1.5 μg/m^3	1.5 μg/m^3

Notes: 1. The $PM_{2.5}$ standard (particulate matter with a 2.5 μm diameter or smaller) was promulgated in December 2004 and is in effect as of 5 April 2005. The standard will be implemented over
2. The 8-hour O_3 standard replaced the 1-hour standard in June 2005.
AAM = Annual Arithmetic Mean; ppm = parts per million; μg/m^3 = micrograms per cubic meter.

Source: 40 CFR 50.

State Implementation Plan. For non-attainment regions, the states are required to develop a State Implementation Plan (SIP) designed to eliminate or reduce the severity and number of NAAQS violations, with an underlying goal to bring state air quality conditions into (and maintain) compliance with the NAAQS by specific deadlines. The SIP is the primary means for the implementation, maintenance, and enforcement of the measures needed to attain and maintain the NAAQS in each state.

Visibility. CAA Section 169A established the additional goal of prevention of further visibility impairment in Prevention of Significant Deterioration (PSD) Class I areas. Visibility impairment is defined as a reduction in the visual range and atmospheric discoloration. Determination of the significance of an activity on visibility in a PSD Class I area is typically associated with evaluation of stationary source contributions. The USEPA is implementing a Regional Haze rule for PSD Class I areas that will address contributions from mobile sources and pollution transported from other states or regions.

Emission levels are used to qualitatively assess potential impairment to visibility in PSD Class I areas. Decreased visibility may potentially result from elevated concentrations of PM_{10} and SO_2 in the lower atmosphere.

General Conformity. CAA Section 176(c), General Conformity, established certain statutory requirements for federal agencies with proposed federal activities to demonstrate conformity of

the proposed activities with each state's SIP for attainment of the NAAQS. Federal activities must not:

(a) cause or contribute to any new violation;

(b) increase the frequency or severity of any existing violation; or

(c) delay timely attainment of any standard, interim emission reductions, or milestones in conformity to a SIP's purpose of eliminating or reducing the severity and number of NAAQS violations or achieving attainment of NAAQS.

General conformity applies only to nonattainment and maintenance areas. If the emissions from a federal action proposed in a nonattainment area exceed annual thresholds identified in the rule, a conformity determination is required of that action. The thresholds become more restrictive as the severity of the nonattainment status of the region increases.

Stationary Source Operating Permits. In Alaska, the Alaska Department of Environmental Conservation has primary jurisdiction over air quality and stationary source emissions at Elmendorf AFB. Title V of the CAA Amendments of 1990 requires states to issue Federal Operating Permits for major stationary sources. A major stationary source in an attainment or maintenance area is a facility (i.e., plant, base, or activity) that emits more than 100 tons per year (TPY) of any one criteria air pollutant, 10 TPY of a hazardous air pollutant, or 25 TPY of any combination of hazardous air pollutants. Thresholds are lower for pollutants for which a region is in nonattainment status. The purpose of the permitting rule is to establish regulatory control over large, industrial activities and to monitor their impact upon air quality.

3.4.2 Existing Conditions

Regional Air Quality. Federal regulations at 40 CFR 81 delineate certain air quality control regions (AQCRs), which were originally designated based on population and topographic criteria closely approximating each air basin. The potential influence of emissions on regional air quality would typically be confined to the air basin in which the emissions occur. Elmendorf AFB is located on the outskirts of Anchorage within the Cook Inlet Intrastate AQCR (AQCR 8), which encompasses 44,000 square miles including the Municipality of Anchorage, the Kenai Peninsula Borough, and the Matanuska-Susitna Borough (40 CFR 81).

Attainment Status. A review of federally published attainment status for Alaska indicated that Anchorage is in attainment of NAAQS for all criteria pollutants except for the community of Eagle River, which is designated as nonattainment for PM_{10}, and located approximately 10 miles northeast of Elmendorf AFB. Also, a portion of Anchorage recently achieved attainment for CO in 2002, and is currently operating under a maintenance plan to assure continued attainment with the standard. The plan relies on control strategies needed to assure attainment of the NAAQS for CO. The strategy focuses on the Federal Motor Vehicle Emission Control Program, I/M program, ethanol-blended gasoline program, wintertime transit service, and promotion of engine preheaters. Elmendorf AFB is located adjacent to the northern boundary of this CO maintenance area.

PSD Class I Areas. No mandatory federal PSD Class I areas are located within the ROI. The nearest PSD Class I area is Denali National Park, which is 100 miles north-northwest of Elmendorf AFB.

Climate. Elmendorf AFB is located in the maritime zone of south-central Alaska, with moderate temperatures in both winter and summer. Mean annual precipitation is approximately 16 inches, with snowfall averaging around 80 inches per year. Summertime highs average in the low to mid-60s and wintertime lows average in the low to mid-single digits Fahrenheit. Prevailing winds in Anchorage are generally light and from the north to northeast during September through April and from the south to southwest from May to August. Seasonal mixing heights for Anchorage, which is the upper limit of the atmosphere in which ground-based emissions are expected to affect air quality, average around 2,000 feet and may reach 1,000 feet during winter months.

Current Emissions. Air emissions at Elmendorf AFB result from stationary and mobile sources. Stationary sources include boilers, emergency generators, and aircraft maintenance operations. Mobile sources include ground-based vehicles and aircraft. Elmendorf AFB is considered to be a major source of air emissions. For permitting purposes, Elmendorf AFB has been divided into nine different facilities based on their industrial classifications, rather than on their collective ownership and control by the Air Force. Only two of eight facilities, the Elmendorf Hospital and the Elmendorf Flightline, have potential criteria pollutant emissions large enough to require federal Title V operating permits. Elmendorf AFB also holds Owner Requested Limits, not included in the Title V permits, for Fire Protection Pumps and Road Painting. A recent summary of potential emissions is presented in Table 3.4-2.

Table 3.4-2. Baseline Potential Stationary Source Emissions at Elmendorf AFB

Description	ANNUAL EMISSIONS (TONS PER YEAR)				
	NO_x	*CO*	*PM_{10}*	*SO_x*	*VOC*
Flight Line	164	99	27	158	29
Communications	54	15	6	29	14
Real Estate	111	92	12	1	6
Automotive Repair and Services	5	4	3	< 1	6
Health Services	58	33	4	26	3
Admin/Engineering	84	54	14	9	5
Fire Prevention	38	13	3	4	3
National Security	3	2	< 1	< 1	< 1

NO_x = nitrogen oxides; CO = carbon monoxide; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; SO_x = sulfur oxides; VOC = volatile organic compound
Source: Air Force 2005b.

Mobile source emissions have not been apportioned based on industrial classifications. A total of 41,340 aircraft operations occurred at Elmendorf AFB during 2005. These operations involved a total of 83 aircraft based at Elmendorf, plus a range of transient users. A survey was conducted in 2002 to estimate mobile source emissions, which are presented in Table 3.4-3.

Table 3.4-3. Baseline Mobile Source Emissions at Elmendorf AFB

Description	ANNUAL EMISSIONS (TONS PER YEAR)				
	NO_x	*CO*	*PM_{10}*	*SO_x*	*VOC*
Aircraft based at Elmendorf AFB	529	353	95	144	59
Transient Aircraft	72	150	43	17	8
On-Wing Engine Testing	17	1	< 1	< 1	< 1
Aerospace Ground Support Equipment	175	25	8	5	1
Non-Road/Non-Vehicle Equipment	< 1	8	3	< 1	< 1
Government-Owned Vehicles	13	73	7	12	1
Privately-Owned Vehicles	33	367	24	215	3
TOTAL	**840**	**967**	**180**	**393**	**73**

NO_x = nitrogen oxides; CO = carbon monoxide; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; SO_x = sulfur oxides; VOC = volatile organic compound
Source: Air Force 2005b.

Regional Air Emissions. The previous section lists on-base emissions for Elmendorf AFB. The NEPA process, however, must also consider impacts from indirect emissions from stationary and mobile sources related to the project, some of which (for example, commuting of new employees to and from the facility) occur outside of the installation. For comparison purposes, Table 3.4-4 lists emissions for Greater Anchorage Area, and for Cook Inlet AQCR (AQCR 8, which includes the borough).

Table 3.4-4. Regional Emissions for Elmendorf AFB
Affected Environment

	POLLUTANTS (IN TONS PER YEAR)				
	NO_x	*CO*	*PM_{10}*	*SO_2*	*VOC*
Greater Anchorage Area	10,740	123,883	19,856	920	5,764
Total Cook Inlet AQCR	28,203	332,021	67,013	1,780	56,708

NO_x = nitrogen oxides; CO = carbon monoxide; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound
Source: USEPA 2005b.

3.5 Physical Resources

3.5.1 Definition of the Resource

Physical resources consist of earth and water resources and hazardous materials and waste management. Hazardous materials are identified and regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); the Occupational Safety and Health Administration; and the Emergency Planning and Community Right-to-Know Act. Hazardous materials have been defined in AFI 32-7086, *Hazardous Materials Management*, to include any substance with special characteristics that could harm people, plants, or animals. Hazardous waste is defined in the Resource Conservation and Recovery Act (RCRA) as any

solid, liquid, contained gaseous or semisolid waste, or any combination of wastes that could or do pose a substantial hazard to human health or the environment. Waste may be classified as hazardous because of its toxicity, reactivity, ignitibility, or corrosivity. In addition, certain types of waste are "listed" or identified as hazardous in 40 CFR 263. The ROI for this resource is defined as Elmendorf AFB.

3.5.2 Existing Conditions

3.5.2.1 Earth Resources

Earth resources include the geology, soils, and topography of Elmendorf AFB. The principal geologic factors influencing stability of structures are soil stability and seismic properties. Soil, in general, refers to unconsolidated earthen materials overlying bedrock or other parent material. Soil structure, elasticity, strength, shrink-swell potential, and erodibility all determine the ability for the ground to support structures and facilities. Relative to development, soils typically are described in terms of their type, slope, physical characteristics, and relative compatibility or limitations with regard to particular construction activities and types of land use. Long-term geological, erosional, and depositional processes typically influence the topographic relief of an area.

The bedrock beneath Elmendorf AFB consists of Tertiary clastic sedimentary rocks, which to the east form a wedge overlying Mesozoic metamorphic rocks of the Chugach Mountains. Glacial and related deposits, including terminal moraines, ground moraines, and glacial outwash plains, dominate regional landforms on Elmendorf AFB and in the Anchorage area. The most distinctive landform at Elmendorf AFB is the Elmendorf Moraine, a southwest-northeast trending terminal moraine. The moraine consists of horizontally and vertically discontinuous, unconsolidated glacial till with poorly sorted boulders, gravel, sand and silt deposits. Finer-grained clay lens deposits are found throughout the moraine and may result in zones of perched groundwater. The southern boundary of the moraine is visible as a rising bluff line along the north side of Elmendorf's east-west runway. Moraine elevations range from 200 to 300 feet MSL. The northern limit of the proposed project area engages the southern terminus of the moraine.

South of the Elmendorf Moraine lies the glacial outwash plain alluvium. The alluvium deposits were formed by a series of coalescing streams resulting from glacial melt water. These outwash plain deposits consist of unconsolidated fine- to medium-grained, poorly sorted sand and gravel. Elevations range from 100 to 225 feet MSL. Relief is mostly flat, and slopes gently to the south-southwest. Most of the developed areas on the base have been built in the outwash plain alluvium. Over 90 percent of the contaminated sites are located in this area.

Underlying glacial moraine and outwash deposits are the shallow marine deposits of the Bootlegger Cove formation. The Bootlegger Cove formation is a fine-grained glacioestuarine deposit consisting of silt and clay. Depth to the Bootlegger Cove formation ranges from 1 to 60 feet below ground surface near the moraine and from 75 to 100 feet below ground surface throughout the outwash plain. Overall, the formation is thought to be at least 125 feet thick and may be more than 250 feet thick in certain locations.

Soils at Elmendorf AFB and the surrounding area are dominated by three types of unconsolidated deposits: coarse-grained, fine-grained, and till. Based on grain size and moisture content, these soil types likely have low to moderate potential for erosion by water or wind. The runway area at Elmendorf AFB is underlain by surficial zones of sand and gravel deposited as either glacial outwash or alluvium along stream channels. The sand and gravel is typically well drained, high in strength, low in compressibility, nonfrost susceptible, and an excellent foundation material.

Project areas under consideration for the development of a 176 WG Area of Operations under the Proposed Action are located astride the interface between soils of the Elmendorf Moraine and the adjacent outwash plain. The northern margin of the proposed project area extends onto the moraine itself. Intermixing and crossbudding of coarse and fine material is typical of areas like this; individual investigations will likely be appropriate during development of sites.

Elmendorf AFB is located in an area that is seismically active and has also been affected by volcanic eruptions of Mount Spurr, Mount St. Augustine, and Mount Redoubt. The Mount St. Augustine volcanic eruption in January 2006 threatened the Anchorage area with ash deposition. Two earthquake faults border the Anchorage area. The Border Ranges Fault bisects the area east of Elmendorf AFB and a second fault runs in the Chugach Mountains. Elmendorf AFB lies in a tectonic basin bounded by the Bruin Bay-Castle Mountain fault system to the west and the Denali fault system to the north. This is an active tectonic setting, with seismic events along both fault systems as well as the underlying Benioff Zone. This zone results from subduction forces pushing the Pacific tectonic plate beneath the North American plate. Intermediate to shallow seismic incidents related to the fault systems, as well as deeper events associated with the subduction, are common. The 1964 earthquake triggered numerous landslides in the Anchorage area, including nearby areas along the Knik Arm. The sliding was attributed both to failures in sensitive clays and the liquefaction of the sandy layers in the upper portions of Bootlegger Cove Formation and to the unusually long duration of the earthquake.

3.5.2.2 Water Resources

Water resources include surface and groundwater features located within the base as well as watershed areas affected by existing and potential runoff from the base, including floodplains.

Elmendorf AFB is divided into seven resource management units based on environmental, physical, and/or social features such as watersheds, topography, land use patterns, ownership, and roads. The only unit under coastal zone management is Unit 7, Coastal Mudflats. Within this unit, there may be areas of special concern that require special management activities. The Coastal Mudflats (Unit 7) contains approximately 150 acres of shoreline that are within the coastal zone boundary managed by Elmendorf AFB (Air Force 2004a). In addition to the Coastal Zone Management Act of 1972 (16 USC 1451 *et seq.*) as amended through the Coastal Zone Act Reauthorization Amendments of 1990 and P.L. 104-150, the Coastal Zone Protection Act of 1996, this unit falls under other specific regulations, including the Marine Protection, Research, and Sanctuaries Act (33 USC 1401 *et seq.*), the Marine Mammal Protection Act of 1972 (16 USC 1361 *et seq.*) as amended through 1997, and the Rivers and Harbors Act of 1899 (33 USC 403). Federal lands are excluded from coastal zone boundaries. However, all uses and activities that directly affect the coastal area must be consistent to the maximum extent practical

with the Alaska Coastal Management Program and they are subject to the consistency provisions of Section 307 of the Coastal Zone Management Act of 1972, as amended (16 USC 1451 *et seq.*). The "Integrated Natural Resources Management" implementation (Air Force 1994) directs that bases with coastal or marine properties must enter into an agreement with the Coastal American National Implementation Team to assist in the restoration and protection of coastal areas.

The Air Force has a Memorandum of Understanding with Coastal America (Coastal America 1992) to perform the following:

- Protect, preserve, and restore the nation's coastal ecosystems through existing federal capabilities and authorities.
- Collaborate and cooperate in the stewardship of coastal living resources by working together and in partnership with other federal programs.
- Provide a framework for action that effectively focuses expertise and resources on jointly identified problems to produce demonstrable environmental and programmatic results that may serve as models for effective management of coastal living resources.

The Proposed Action location is not within the 150 acres of shoreline that are within the coastal zone boundary managed by Elmendorf AFB.

Surface Water. The four major hydrologic systems at Elmendorf AFB, in order of decreasing size, are Ship Creek, Six-Mile Creek, EOD Creek, and the Cherry Hill Ditch. There are also a total of 12 natural and man-made lakes and ponds on the base that range in size from 1 acre to nearly 124 acres in surface area. Elmendorf AFB has 8 miles of saltwater shoreline bordering the Knik Arm of the Cook Inlet.

Ship Creek is the largest surface water drainage system on Elmendorf AFB. The Ship Creek headwaters are located within the Chugach State Park at an elevation of 5,100 feet. The stream flows west through the southern edge of Elmendorf AFB for approximately 4.2 miles and empties into the Knik Arm. The upper Ship Creek basin is an important recharge area for the deeper confined aquifer and provides approximately one quarter of total recharge to the system.

Six-Mile Creek and EOD Creek are located north of the Elmendorf Moraine. Six-Mile Creek originates as springs located near the Elmendorf AFB and Fort Richardson boundary. Cherry Hill Ditch is the major storm water drainage system for the main base area south of the Elmendorf Moraine.

A small water body is located to the north and west of the area proposed for development of the 176 WG Area of Operations. This unnamed pond is located within the Elmendorf Moraine and is well upslope from ANG areas likely to experience ground disturbance associated with construction.

The base maintains compliance with its National Pollutant Discharge Elimination System (NPDES) Multi-Sector General Permit for protection of surface water by non-point source

pollutants. Surface water is also protected by measures outlined in Elmendorf AFB's SWPPP, which has identified potential pollutant sources and relevant best management practices (BMPs) to reduce the potential for pollution of receiving waters (Air Force 2005c). In addition to the Elmendorf AFB SWPPP, any new construction projects on Elmendorf AFB that would affect more than 1 acre are required to develop a project-specific SWPPP, implement BMPs, and notify the USEPA about the project.

Groundwater. Two principal groundwater aquifers have been identified in the glacial outwash plain alluvium and on the Elmendorf Moraine. These aquifers include a shallow unconfined aquifer (shallow aquifer), and a deeper confined aquifer. The Bootlegger Cove formation acts as the confining layer between the shallow and deep aquifers. In general, groundwater flow direction in the shallow aquifer matches closely that of the surface topography. Subsurface flow is to the northwest along the north limb of the moraine, and to the southeast along the south limb. The groundwater divide coincides with the crest of the moraine. The shallow aquifer on Elmendorf is not used for drinking water. This aquifer generally exists between 10 to 50 feet below ground surface.

The deeper confined aquifer is found under the entire base and generally flows in a westerly direction from the Chugach Mountains toward Knik Arm of the Cook Inlet. Groundwater from the deeper confined aquifer at Elmendorf AFB serves only as a standby drinking water supply when surface water supplies cannot meet the demand. However, the municipal area bordering Elmendorf AFB uses groundwater for various services including industrial, commercial, domestic, and public supply. Based upon groundwater monitoring data, there is contamination in portions of the shallow aquifer on-site. The Final Environmental Restoration Program Atlas (Air Force 2007) shows active plume locations (groundwater contamination in the shallow aquifer) for restoration sites. However, the deeper confined aquifer has not been impacted by any contaminants from sources on Elmendorf AFB. The Bootlegger Cove formation seems an effective barrier between the aquifers; there is no evidence they are interconnected.

The main source of drinking water for Elmendorf AFB is supplied by Fort Richardson. The Fort Richardson water treatment plant draws surface water from Ship Creek and filters and treats the water before it is delivered to the base through four water mains.

3.5.2.3 Hazardous Materials, Waste Management, and Elmendorf Environmental Program

Hazardous Materials. The majority of hazardous materials used by Air Force and contractor personnel at Elmendorf AFB are controlled through an Air Force pollution prevention process called Hazardous Materials Pharmacy (HAZMART). This process provides centralized management of the procurement, handling, storage, and issuing of hazardous materials and turn-in, recovery, reuse, or recycling of hazardous materials. The HAZMART process includes review and approval by Air Force personnel to ensure users are aware of exposure and safety risks. Pollution prevention measures are likely to minimize chemical exposure to employees, reduce potential environmental impacts, and reduce costs for material purchasing and waste disposal.

Hazardous Waste Management. Elmendorf AFB is a large-quantity hazardous waste generator. Hazardous wastes generated during operations and maintenance activities include combustible solvents from parts washers, inorganic paint chips from lead abatement projects, fuel filters, metal-contaminated spent acids from aircraft corrosion control, painting wastes, battery acid, spent x-ray fixer, corrosive liquids from boiler operations, toxic sludge from washracks, aviation fuel from tank cleanouts, and pesticides.

Hazardous wastes are managed in accordance with the Elmendorf AFB OPlan 19-3. Hazardous wastes are initially stored at approximately 50 satellite accumulation areas. Satellite accumulation areas allow for the accumulation of up to 55 gallons of hazardous waste (or one quart of an acute hazardous waste) to be stored at or near the point of waste generation. Elmendorf has a USEPA Part B permit to operate a hazardous waste Treatment, Storage, and Disposal Facility (TSDF) on Elmendorf. This TSDF can store hazardous waste for up to one year and is located on 11735 Vandenberg Avenue. All hazardous waste generated on Elmendorf is shipped to other USEPA-permitted facilities in the continental U.S. for disposal. The base is identified by USEPA identification number AK8570028649. In FY2005, 56,568 pounds of hazardous waste were removed from Elmendorf AFB and disposed of in off base permitted disposal facilities.

The Elmendorf AFB Spill Prevention Control and Countermeasures Plan (SPCC) is a written document that describes measures Elmendorf has taken to prevent, contain, and clean up oil spills. The term "oil" includes gasoline, diesel, heating oil, and solvents. The Elmendorf SPCC plan, which was approved by USEPA and the Alaska Department of Environmental Conservation, also demonstrates that the base has put in place containment and other countermeasures that would prevent oil spills that could reach navigable waters.

The Elmendorf AFB Asbestos Management Plan provides guidance on the management of asbestos. An asbestos facility register is maintained by Civil Engineering. Persons inspecting, designing, or conducting asbestos response actions in public or commercial buildings must be properly trained and accredited through an applicable asbestos training program. The design of building alteration projects and requests for self-help projects are reviewed to determine if asbestos contaminated materials are present in the proposed work area and, if so, are disposed of in an off base permitted landfill.

Environmental Cleanup. The Elmendorf Environmental Program includes two different cleanup programs, the Environmental Restoration Program (ERP) and the Compliance Program. The DoD developed the ERP to identify, investigate, and remediate potentially hazardous material disposal sites on DoD property prior to 1984. In August 1990, Elmendorf AFB was placed on the National Priorities List bringing it under the federal facility provisions of CERCLA Section 120. Currently the Air Force has identified 85 sources of contamination from operations that occurred prior to 1984. These sources have been placed into three groups: CERCLA sources (40 sources), state program sources (40 sources), and RCRA sources (5 sources) (Air Force 2003a). The Compliance Program manages contaminated sites identified after 1984. Currently, the Compliance Program includes 77 sites placed into three groups: no further action (46 sites), monitored natural attenuation (28 sites), and other remedial actions (3 sites).

Five proposed project locations north of Runway 06/24 and four south of Runway 06/24 are within 200 feet of environmental sites. These sites include six ERP sources, five ERP

groundwater plumes, and two compliance sites. The ERP sources are CERCLA sites SD-24, SD-25, SD-27, SD-30, SA-99, and state program site ST-64. The ERP plumes are Hangar 11 Plume, Hangar 10 Plume, Fairchild Plume, Kenney Avenue Plume, and OU5MW-02 Plume. The Compliance Sites are ST-421 and ST-522.

ERP site SD-24 has two locations. One is located just north of Hangar 10 and a second location is southwest of Hangar 10. Wash and rinse waters, containing a petroleum-based solvent used for parts degreasing, drained into a dry well for a period of time prior to the wash rack being connected to the sanitary sewer.

ERP site SD-25 is located just east of Hangar 11. Remedial Actions are currently underway. Primary contaminants of concern include Benzene, Ethylbenzene, and Toluene. In-situ bioventing for soil contaminants has been completed.

ERP site SD-27 is located just west of the new Aircraft Support Equipment Shop. Solvents, paint wastes, and petroleum hydrocarbons from aircraft cleaning and painting disposed of in the floor drain are the cause of the contamination. Contamination has been remediated to the maximum extent practicable and no further remedial action is required or planned.

ERP site SD-30, located at the Vehicle Maintenance Shop Building 21-900 (6211 Arctic Warrior Drive), serviced most Air Force vehicles on the base. Solvent and fuel contamination discharged into floor drains which lead to sumps and discharged north of the building and to a dry well south of the building. Contamination has been remediated to the maximum extent practicable and no further remedial action is required or planned. However, groundwater is still impacted and will be monitored until cleanup levels are achieved.

ERP site ST-64 contained four underground storage tanks (USTs) that have been removed. Remediation of the site has included monitored natural attenuation. Further action will be required if site uses change.

SA-99 is located across Arctic Warrior Drive from Hangar 18. The original investigation of this site discovered petroleum-contaminated soils and metal drums in various stages of decay. Sample results determined that some of the soil was contaminated with petroleum products and had traces of lead, polychlorinated biphenyls, and pesticides. Further investigation was unable to detect contamination and no further remedial action is required or planned.

ST-421 is the site of four, regulated steel USTs: a 2,500-gallon UST, which held motor vehicle gasoline; a 3,000-gallon UST, which held jet propulsion fuel (JP-4); and a 3,000-gallon UST and a 500-gallon UST, which both held diesel fuel. Dispensers for re-fueling were located immediately to the northeast of the USTs. The USTs, dispensers, and associated piping were removed in June 1995. The selected remedy for this site is monitored natural attenuation.

Compliance site ST-522 is adjacent to Hangar 11. This site contained an unregulated 20,000-gallon steel UST that was removed in 1996; 171 tons of contaminated soil have been excavated and removed to the maximum extent possible within site limitations. Groundwater will continue to be monitored.

Hangar 10 and Hangar 11 Plumes are fuel plumes, and Fairchild, Kenney Avenue, and OU5MW-02 Plumes are solvent plumes. The plumes exist in the shallow groundwater aquifer. Their boundaries are approximated based upon the most current groundwater monitoring results. Use of Elmendorf AFB shallow aquifer within the designated groundwater control boundary for any purpose including, but not limited to, drinking, irrigation, fire control, or any other activity is strictly prohibited. Portions of the shallow aquifer are contaminated and may pose a health risk. The shallow aquifer is defined as any unconfined, saturated, water-bearing zone below the ground surface.

3.6 Biological Resources

3.6.1 Definition of the Resource

Biological resources in this discussion refers to plants and animals and the habitats in which they occur on and within the environs of Elmendorf AFB. Assemblages of plant and animal species within a defined area that are linked by ecological processes are referred to as natural communities. The existence and preservation of these resources are intrinsically valuable; they also provide aesthetic, recreational, and socioeconomic values to society. This section focuses on plant and animal species or vegetation types associated with Elmendorf AFB that typify or are important to the function of the ecosystem, are of special societal importance, or are protected under federal or state law or statute. For purposes of the analysis, Elmendorf and neighboring biological resources will be organized into three major categories: (1) vegetation and habitat, including wetlands; (2) fish and wildlife; and (3) special-status species.

Federal laws and regulations that apply to biological resources include: Fish and Wildlife Coordination Act, Migratory Bird Treaty Act, Clean Water Act, NEPA, Federal Land Policy and Management Act, ESA, Sikes Act, Marine Mammal Protection Act, state hunting regulations, and state laws protecting plants and nongame wildlife.

The ROI for biological resources is Elmendorf AFB and its immediate vicinity. Specifically, effects to biological resources will focus on the footprint for construction activities and any potential for construction or operation of facilities to impact biological resources.

Vegetation includes all existing terrestrial plant communities, but excludes discussion of special-status plants, which are discussed under special-status species below. The composition of plant species within a given area defines ecological communities and determines the types of wildlife that may be present. Wetlands are a special category of sensitive habitats and are subject to regulatory authority under Section 404 of the Clean Water Act, Executive Order (EO) 11990 *Protection of Wetlands*, and EO 19988 *Floodplain Management*. The USACE administers the Clean Water Act, and has jurisdiction over all waters of the U.S., including wetlands. Jurisdictional wetlands are those areas that meet all the criteria defined in the USACE's *Wetlands Delineation Manual* (Environmental Laboratory 1987).

Fish and Wildlife includes all vertebrate animals with the exception of special-status species, which are discussed separately. Typical animals include vertebrate groups such as fish, amphibians, songbirds, waterfowl, hoofed animals, carnivores, bats, rodents and other small mammals. The attributes and quality of available habitats determine the composition, diversity, and abundance patterns of wildlife species assemblages, or communities. Each species has its

own set of habitat requirements and interspecific interactions driving its observed distribution and abundance. Community structure is derived from the net effect of the diverse resource and habitat requirements of each species within a geographic setting. For this reason, an assessment of habitat types and area affected by the Proposed Action can serve as an overriding determinant in the assessment of impacts for wildlife populations.

Special-status Species are defined as those plant and animal species listed as threatened, endangered, candidate, or species of concern by the USFWS or the National Marine Fisheries Service, as well as those species with special-status designations by the state of Alaska. The ESA protects federally listed threatened and endangered plant and animal species. Candidate species are species that USFWS is considering for listing as threatened or endangered but for which a proposed rule has not yet been developed. Candidates do not benefit from legal protection under the ESA. In some instances, candidate species may be emergency listed if USFWS determines that the species population is at risk due to a potential or imminent impact. The USFWS encourages federal agencies to consider candidate species in their planning process because they may be listed in the future and, more importantly, because current actions may prevent future listing. Species of concern are species for which data were inconclusive to support ESA protection at the time of the proposed listing. It is an informal designation, although USFWS recommends tracking of population trends and threats. The Alaska Department of Fish and Game also maintains a list of endangered species and species of special concern.

3.6.2 Existing Conditions

Vegetation. Elmendorf AFB is situated across rolling upland plains near the head of Cook Inlet (Knik Arm) in southcentral Alaska within the Coastal Trough Humid Taiga Province (Bailey 1995). The area is characterized by spruce-hardwood forests, bottomlands of spruce-poplar forests along major drainages, and dense stands of alder and willow along riparian corridors. Wet tundra communities bracket the coast. Much of the area immediately surrounding the developed portion of the base is dominated by secondary growth poplar and alder. Approximately 4,202 acres of Elmendorf AFB's 13,455 acres are disturbed or cleared for base facilities (Air Force 2006b).

There are 1,534 acres of wetlands at Elmendorf AFB (Air Force 2006b). Wetland types are varied and range from palustrine scrub-shrub and forested wetlands to lacustrine and estuarine wetlands.

Fish and Wildlife. Elmendorf AFB supports a diverse array of wildlife species, including large and small mammals, raptors, waterfowl, songbirds, and fish. Due to the northerly latitude of the base, no reptiles occur, while the wood frog (*Rana sylvatica*) is the only amphibian species.

Moose (*Alces alces*), black bears (*Ursus americanus*), brown bears (*u. arctos*), and wolves (*Canis lupus*) are prevalent on the base and are typical residents of the Alaskan environment. These species have large home ranges which also includes the neighboring Fort Richardson and Chugach State Park. Between 20 and 70 moose are estimated by Alaska Fish and Game to live on Elmendorf AFB, depending on the time of year, as portions of the herd migrate off base in fall and winter. Twelve to 24 black bears occur in summer, while 6 to 12 of these will spend the winter in dens on the base. Three to 6 brown bears inhabit Elmendorf AFB in summer. Two

wolf packs roam the lands of Elmendorf AFB and Fort Richardson (Air Force 2006b). Coyotes (*Canis latrans*) and red fox (*Vulpes vulpes*) are also common. Lynx (*Lynx canadensis*) also occur during cyclic peaks in southcentral Alaska populations.

Elmendorf AFB also supports populations of small mammals including beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), porcupine (*Erethizon dorsatum*), red squirrel *(Tamiasciurus hudsonicus*), snowshoe hare (*Lepus americanus*), river otter (*Lutra canadensis*), short-tailed weasel (*Mustela erminea*), and mink (*M. vison*).

At least 112 bird species are known to occur or have the potential to occur at Elmendorf AFB (Air Force 2006b). Waterfowl and shorebirds use the base's ponds, bogs, wetlands, and coastal marshes in summer and on spring and fall migration. Raptors include osprey (*Pandion haliaetus*), red-tailed hawk (*Buteo jamaicensis*), rough-legged hawk (*B. lagopus*), sharp-shinned hawk (*Accipiter striatus*), northern goshawk (*A. gentils*), merlin (*Falco columbarius*), northern harrier (*Circus cyaneus*), northern saw-whet owl (*Aegolius acadius*), boreal owl (*A. funereus*), and great horned owl (*Bubo virginianus*). Bald eagles (*Haliaeetus leucocephalus*) also reside on the base. Common breeding birds include alder flycatcher (*Empidonax alnorum),* boreal chickadee (*Poecile hudsonica*), black-capped chickadee (*P. atricapillus*), gray jay (*Perisoreus Canadensis*), Swainson's thrush (*Catharus ustulatus*), myrtle warbler (*Dendroica coronata*), American robin (*Turdus migraterius*), slate-colored junco (*Junco hyemalis*), ruby-crowned kinglet (*Regulus calendula*), rusty blackbird (*Euphagus carolinus*), and white-winged crossbill (*Loxia leucoptera*). A species checklist may be found in the Elmendorf AFB INRMP (Air Force 2006b).

Ten fish species occur at Elmendorf AFB, including the five Pacific salmon species (Air Force 2006b). Ship Creek and Six-Mile Creek are the main spawning creeks for these anadromous fish on the base.

Special-Status Species. There are no federally listed threatened or endangered species that inhabit Elmendorf AFB. Table 3.6-1 includes a list of special-status species that occur on or near Elmendorf AFB. A single species recently proposed for listing as endangered, the Cook Inlet beluga whale (*Delphinapterus leucas*), occurs in waters of Knik Arm of Cook Inlet adjacent to Elmendorf AFB. Six Alaska species of special concern may occur on or near the base. These are olive-sided flycatcher (*Contopus borealis*), blackpoll warbler (*Dendroica striata*), peregrine falcon (*Falco peregrinus*), gray-cheeked thrush (*Catharus minimus*), Townsend's warbler (*Dendroica townsendi*), and beluga whale. The olive-sided flycatcher and blackpoll warbler are known nesting species on the base (Air Force 2006b). Both species are found in coniferous forests, with the flycatcher preferring more open forests (Ehrlich *et al.* 1988).

The beluga whale is a small, toothed whale that inhabits coastal arctic and subarctic waters. The Cook Inlet population is managed by USFWS and National Oceanic and Atmosphere Administration National Marine Fisheries Service as a distinct population segment under ESA. This population moves in small groups throughout Cook Inlet and its associated arms. Recent declines have led USFWS to publish a proposed rule for listing the Cook Inlet beluga as an endangered species. This proposed rule is currently in its comment period. Cook Inlet beluga whales may occur seasonally in waters off Elmendorf AFB.

Table 3.6-1. The Relationship of Special-Status Species to Elmendorf AFB and Environs

Common Name	*Scientific Name*	*Status*	*Occurrence at Elmendorf AFB*
Aleutian shield fern	*Polystichum aleuticum*	FE	No
Chinook salmon (Fall stock from Snake River)	*Oncorhynchus tshawytscha*	AK SSC	No
Leatherback sea turtle	*Dermochelys coriacea*	FE	No
Short-tailed albatross	*Phoebastria albatrus*	FE, AKE	No
Kittlitz's murrelet	*Brachyramphus brevirostris*	FC	No
Eskimo curlew	*Numenius borealis*	FE, AKE	No
Spectacled eider	*Somateria fisheri*	FT, AK SSC	No
Stellar's eider (AK breeding population)	*Polysticta stelleri*	FT, AK SSC	No
Aleutian Canada goose	*Branta canadensis leucopareia*	AK SSC	No
Peregrine falcon	*Falco peregrinus*	AK SSC	Potential Migrant
Northern goshawk (southeast AK population)	*Accipiter gentilis laingi*	AK SSC	No
Olive-sided flycatcher	*Contopus cooperi*	AK SSC	Yes
Gray-cheeked thrush	*Catharus minimus*	AK SSC	Migrant
Townsend's warbler	*Dendroica townsendi*	AK SSC	Potential
Blackpoll warbler	*Dendroica striata*	AK SSC	Yes
Brown bear (Kenai Peninsula population)	*Ursus arctos horribilis*	AK SSC	No
Sea otter (southwest Alaska distinct population segment)	*Enhydra lutris kenyoni*	FT, AK SSC	No
Harbor seal	*Phoca vitulina*	AK SSC	No
Stellar sea-lion	*Eumetopias jubatus*	FT=eastern population, FE=western population AK SSC	No
Bowhead whale	*Balaena mysticetus*	FE, AK SSC	No
Finback whale	*Balaenoptera physalus*	FE	No
Humpback whale	*Megaptera novaeangliae*	FE, AKE	No
Right whale	*Eubalaena glacialis*	AKE	No
Blue whale	*Balaenoptera musculus*	AKE	No
Beluga whale (Cook Inlet population)	*Delphinapterus leucas*	FP, AK SSC	No, but occur in adjacent waters.

FE = Federal Endangered; FT = Federal Threatened; FC = Federal Candidate; FP= Federal Proposed for listing; AKE = State of Alaska Endangered; AK SSC = State of Alaska Species of Special Concern.
Sources: Alaska Department of Fish and Game 2005a and 2005b, USFWS 2005.

Peregrine falcon and gray-cheeked thrush migrate through the base area and may be occasionally observed (Air Force 2006b). Peregrine falcons nest on cliffs, generally over water, but these features do not occur at Elmendorf AFB. Peregrines may, however, use riparian and wetland areas on the base to hunt for prey, such as waterfowl. The gray-cheeked thrush breeds in moist coniferous forests and woodlands, arctic tundra, and riparian thickets. It is a habitat generalist on migration (Ehrlich *et al.* 1988), and therefore could occur in various habitats at Elmendorf AFB. Townsend's warbler, another coniferous forest inhabitant, may also occur on base. The Cook Inlet population of beluga whale occurs in waters adjacent to Elmendorf AFB.

Although it has no elevated protection status, the rusty blackbird is a species of particular interest to the Air Force because of recent declines and its occurrence on Elmendorf AFB. This species finds breeding habitat in stands of black spruce. DoD-funded studies are currently being conducted to evaluate its status and habitat.

3.7 Cultural Resources

3.7.1 Definition of the Resource

Cultural resources are any prehistoric or historic district, site, or building, structure, or object considered important to a culture or community for scientific, traditional, religious, or other purposes. They include archaeological resources, historic architectural resources, and traditional resources. Archaeological resources are locations where prehistoric or historic activity measurably altered the earth or produced deposits of physical remains (e.g., arrowheads, bottles). Historic architectural resources include standing buildings and other structures of historic or aesthetic significance. Architectural resources generally must be more than 50 years old to be considered for inclusion in the NRHP, although resources dating to defined periods of historical significance, such as the Cold War era (1946-1989) may also be considered eligible. Traditional resources are associated with cultural practices and beliefs of a living community that are rooted in its history and are important in maintaining the continuing cultural identity of the community. Historic properties (as defined in 36 CFR 60.4) are significant archaeological, architectural, or traditional resources that are either eligible for listing, or listed on, the National Register of Historic Places (NRHP). Both historic properties and significant traditional resources identified by Alaska Natives are evaluated for potential adverse impacts from an action.

For the Proposed Action, the ROI for cultural resources is defined as Elmendorf AFB and its environs.

3.7.2 Existing Conditions

Archaeological Resources

Since the beginning of cultural resource investigations on Elmendorf AFB in 1978, most survey work has been concentrated along the northwest border of the base property. Through these survey efforts 27 archaeological sites have been located, none of which are located within the project areas. While these sites have not been definitively evaluated for NRHP eligibility, 18 are recommended as ineligible, five are unevaluated, and four are considered potentially eligible (Air Force 2003b). Three of the four potentially eligible sites are cabin ruins associated with

homesteading and the fourth, also a cabin ruin, has Alaska Native/traditional features and a possible secondary military association (Air Force 2003b). No NRHP-listed archaeological resources have been located in the project areas (Air Force 2003b; National Register Information Service [NRIS] 2007).

Architectural Resources

There are 52 NRHP eligible buildings or structures on Elmendorf AFB, most of which are located in one of three historic districts: the Flightline Historic District; the Alaska Air Depot Historic District; and the Generals' Quad Historic District (Figure 3.7-1). Of the historic structures outside the three historic districts, Building 15512 is located in the vicinity of the Proposed Action. Also on base are 602 unevaluated facilities constructed during the Cold War era, many of which are now, or will be 50 years old by 2010 (Air Force 2003b). An inventory and NRHP-eligibility evaluation of the Cold War-era facilities at Elmendorf AFB is currently underway (personal communication, Scudder 2007).

Traditional Cultural Properties and Alaska Native Concerns

Although no traditional cultural properties have yet been identified on Elmendorf AFB, neighboring Alaska Natives have raised concerns regarding the possibility of Alaska Native burials located on Elmendorf AFB property (Air Force 2003b). Ongoing consultation between the Air Force and Alaska Natives on this and other issues is conducted on a government-to-government basis. The federally recognized tribes in the nearby Elmendorf AFB area are the Eklutna and Knik Tribes (Air Force 2003b).

3.8 Land Use and Transportation

3.8.1 Definition of the Resource

The attributes of Elmendorf AFB and nearby land use addressed in this analysis include general land use patterns, land ownership, land management plans, and applicable plans and ordinances. General land use patterns characterize the types of uses within a particular area including human land uses, such as agricultural, residential, commercial, industrial, institutional, and recreational, or natural land uses, such as forests, refuges, and other open spaces. Land ownership is a categorization of land according to type of owner; the major land ownership categories associated with Elmendorf AFB include federal and state with nearby private and Alaska Native properties. Land use plans and ordinances, policies, and guidelines establish appropriate goals for future use or regulate allowed uses.

Transportation resources include the infrastructure required for the movement of people, materials, and goods. For this analysis, transportation resources include roads and the railway.

3.8.2 Existing Conditions

Elmendorf AFB is located at the head of Cook Inlet within the Municipality of Anchorage. The installation comprises 13,455 acres of federal land directly north of the Municipality of Anchorage in the southcentral portion of the state of Alaska.

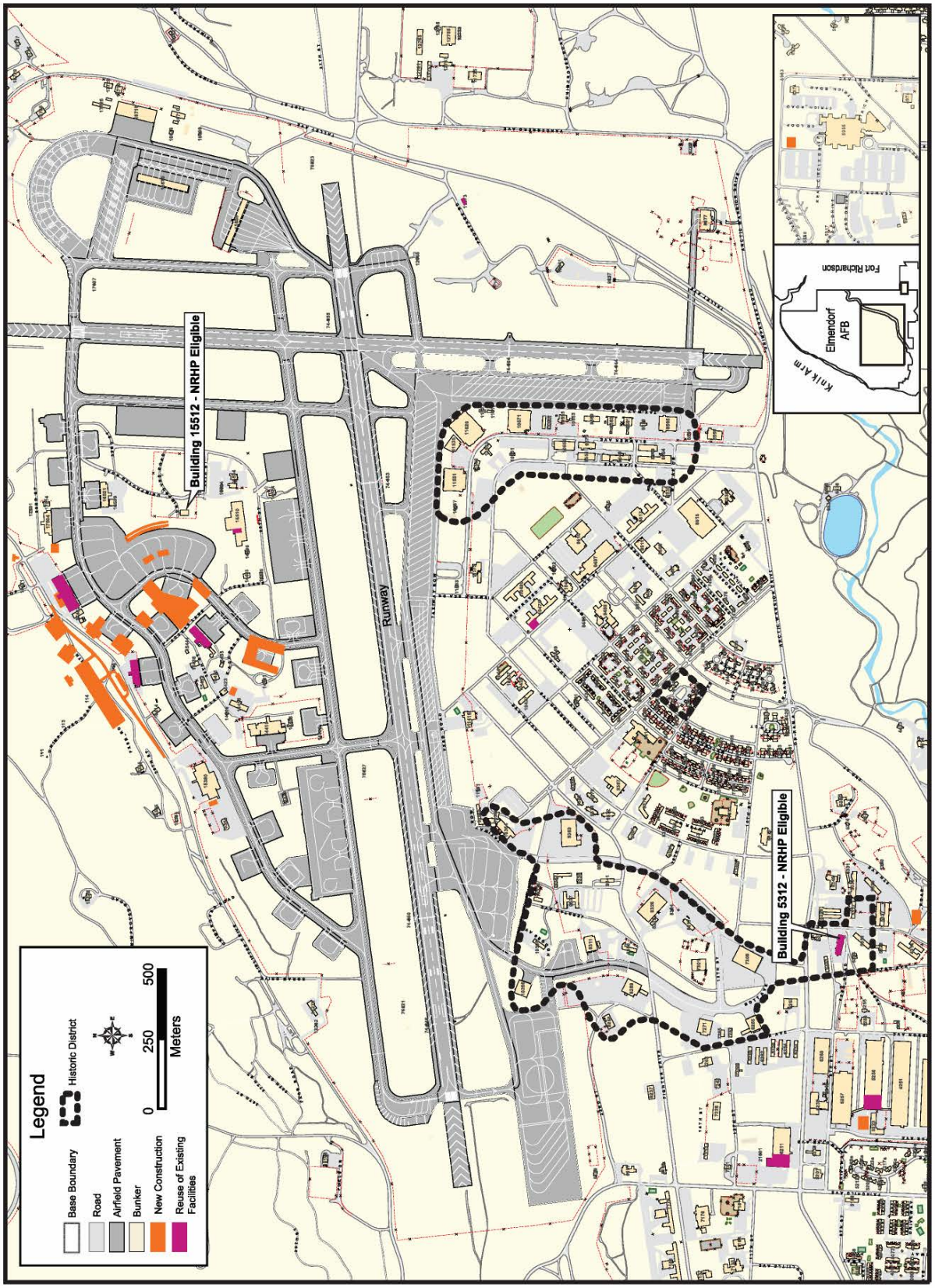


Figure 3.7-1. Elmendorf AFB Historic Districts within the Project Area

Elmendorf AFB Land Use. Figure 3.8-1 depicts existing land uses for Elmendorf AFB. The airfield and related operation function are located in the center and southern part of the base. A variety of other land uses may be found along the southern portion of the base. A large industrial area forms a boundary between the central mixed-use core of the base and the housing and services area in the base's southwest corner. Medical facilities are located in the southeast corner, along with some housing and recreational areas. Large recreational and open space areas are also located north of the airfield (Air Force 2006c). Restricted Use Areas have been designated to prohibit construction of manned facilities in areas that were previously contaminated.

The base is bordered by U.S. Army Fort Richardson to the east. There are various training ranges within the military installations, including maneuver areas, impact areas, and training areas. To the west of Elmendorf AFB are the Port of Anchorage and Cook Inlet/Knik Arm. The Municipality of Anchorage borders the base to the south. Privately held lands in the vicinity of the base are located primarily south and southeast of the base (Air Force 2001b). This includes a residential neighborhood known as Mountain View. Mountain View Elementary School is located on the north side of McPhee Avenue that runs along the southern boundary of Elmendorf AFB.

The base adopted a General Plan in November 2006 that presents a comprehensive planning strategy to support military missions assigned to the installation and guide future installation development decisions. With a 50 year horizon, the plan presents a summary of existing conditions and provides a framework for programming, design and construction, as well as resource management. The future land use plan depicts opportunities for a more functional grouping of land use types through the use of focus areas. Land use for the 50-year vision is depicted in Figure 3.8-2.

Base plans and studies present factors affecting both on- and off-base land use and include recommendations to assist on-base officials and local community leaders in ensuring compatible development in the vicinity of the base. In general, land use recommendations are made for areas affected by both the potential for aircraft accidents (refer to Section 3.3, Safety) and aircraft noise (refer to Section 3.2, Noise). There are safety zones defined for each end of the runway based on the analysis of historic mishap data that defines where most aircraft accidents occur. Incompatible residential uses in the community of Mountain View exist within the safety zones at the end of Runway 16/34.

Noise contours in these plans are generated by the modeling program NOISEMAP. These noise contours are used to describe noise exposure around the base and support compatible land use recommendations. Noise is one of the major factors used in determining appropriate land uses since elevated sound levels are incompatible with certain land uses. When noise levels exceed an L_{dn} of 65 dB, residential land uses are normally considered incompatible. Noise exposure (depicted with contours) from operations expected to occur as a result of approved aircraft at Elmendorf AFB are shown in Figure 3.2-1.

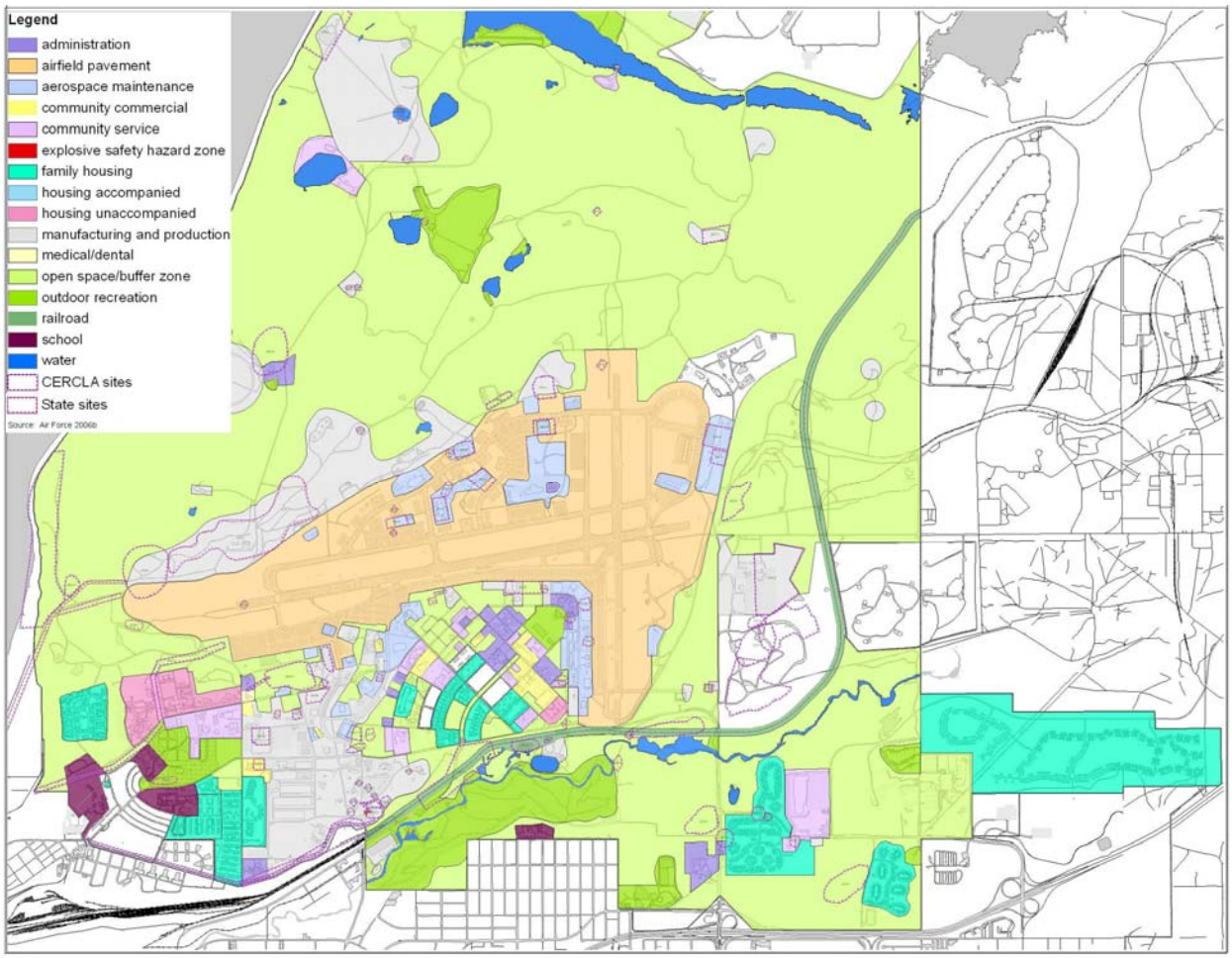


Figure 3.8-1. Elmendorf AFB Existing Land Use

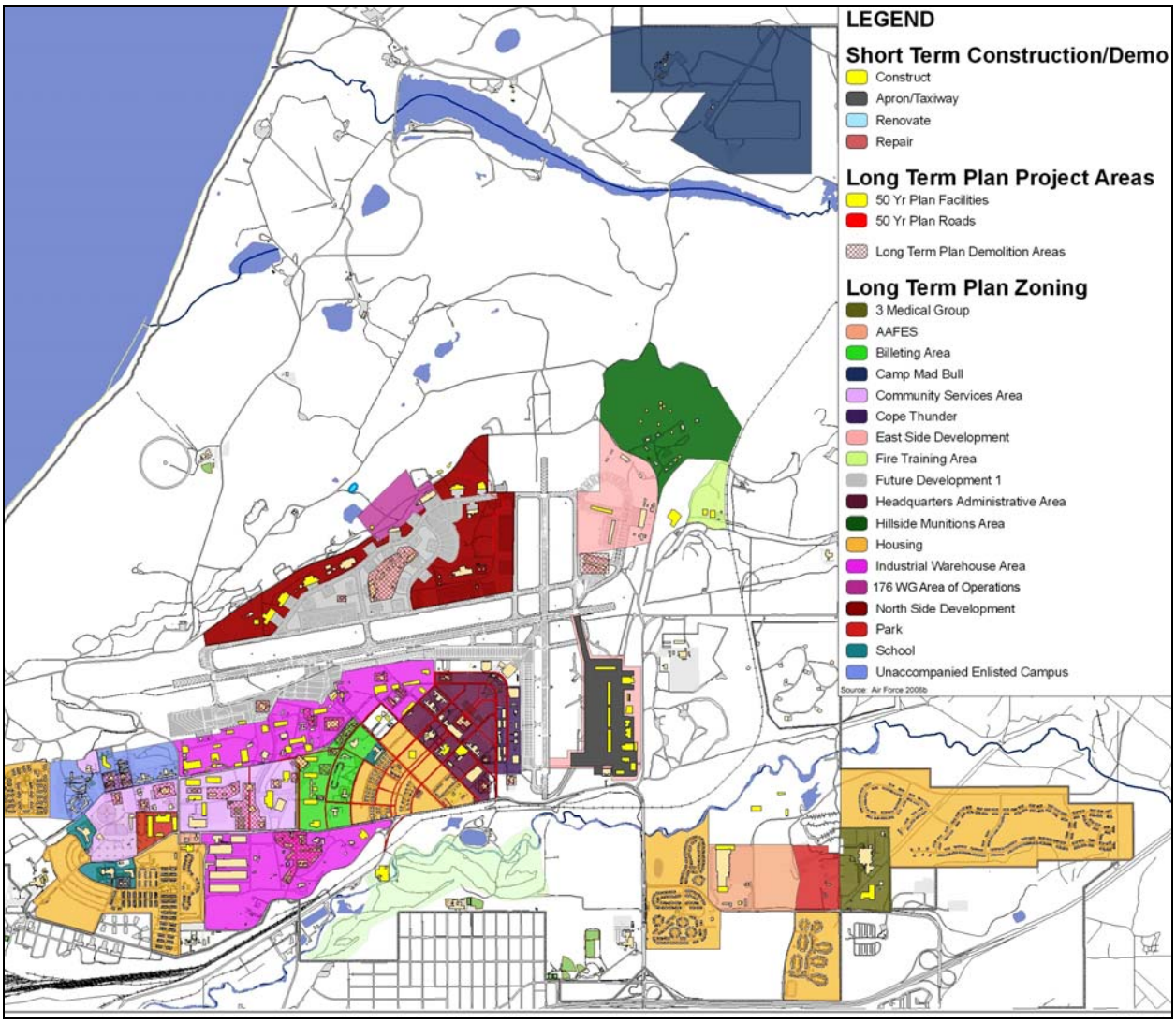


Figure 3.8-2. Land Use for the 50-Year Vision

Transportation. Elmendorf AFB is accessed by Davis Highway from Fort Richardson and Glenn Highway from the south. Vandenburg Avenue extends northward from the main gate (Boniface Gate) about 1.5 miles before intersecting Davis Highway which extends eastward to Fort Richardson.

Roads on Elmendorf AFB form a network independent from vicinity roads (refer to Figure 3.8-3). Access on and off the base occur through four gates on the south side (Boniface, Muldoon, Post Road, and Government Hill), and one access from Fort Richardson (Davis Highway). Vehicular traffic is permitted on most base streets; restricted access may occur for operational or security reasons.

Primary roadways on Elmendorf include Davis Highway and Arctic Warrior Drive. The former serves the eastern portion of the base and provides primary access to Fort Richardson. Provider Drive, which connects to the Glenn Highway, also provides important access to the southeast corner of the base including the hospital. Secondary roadways include Airlifter Drive, Fighter Drive, and Pease Avenue. The proposed relocation area is primarily south of Airlifter Drive; some new facilities will be located north of Airlifter Drive.

The rail line is located in the south and east portions of Elmendorf AFB (refer to Figure 3.8-2). The tracks have been relocated to the east to avoid security and safety hazards. The tracks are within the right of way and belong to the Alaska Railroad Company. All other tracks on the base are owned by the Air Force (Air Force 2004a).

3.9 Socioeconomics

Socioeconomic factors are defined as the basic attributes and resources associated with the human environment. The relevant factors related to the proposed 176 WG beddown at Elmendorf AFB include:

- Population
- Economic activity
- Public services

Data for the socioeconomic analysis in this EA were obtained from a variety of sources, including the Air Force, the U.S. Bureau of the Census, the U.S. Bureau of Economic Analysis, the Alaska Departments of Commerce and Labor, and the Municipality of Anchorage.

3.9.1 Definition of the Resource

Elmendorf AFB is situated in south-central Alaska, just north of Anchorage. Socioeconomic activities associated with the base are concentrated in the Municipality of Anchorage, which comprises the ROI for this analysis. Available socioeconomic characteristics are addressed for the base population and for the Municipality of Anchorage.

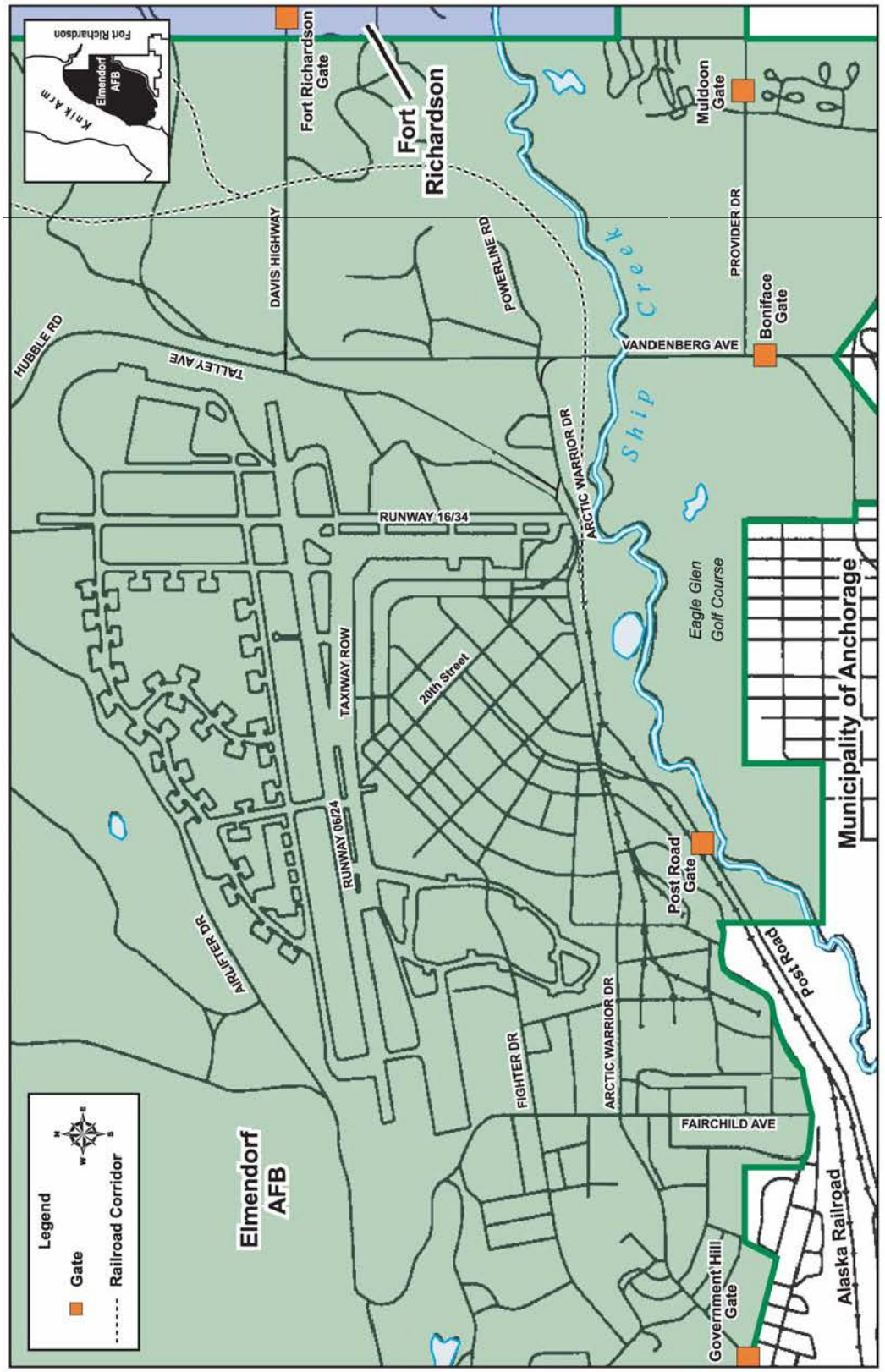


Figure 3.8-3. Elmendorf AFB Roads

3.9.2 Existing Conditions

3.9.2.1 Population and Housing

The population of 18,000 individuals associated with Elmendorf AFB is comprised of 6,500 military personnel, 9,600 military family members, and 1,900 civilian employees (Air Force 2005d). Approximately 7,000 military personnel and their family members reside in on-base housing, including personnel living in privatized housing. Recent private sector on-base housing initiatives have improved housing for Elmendorf and Fort Richardson personnel. The remaining base employees and their families primarily reside within the Municipality of Anchorage, including the communities of Chugiak and Eagle River.

The 2003 population of the Municipality of Anchorage was 270,951 persons. This is an increase between 1990 and 2000 of an average annual rate of 1.4 percent. Population in the municipality is projected to increase at an average annual rate of 0.9 percent to 308,144 persons by the year 2018 (Alaska Department of Labor 1998). Anchorage is the largest city in Alaska, accounting for over 40 percent of the state population. The average household size in the municipality is 2.67 persons. Almost 95 percent of the 100,000 housing units are occupied, yielding a relatively low vacancy rate of 5.5 percent. By comparison, the vacancy rate statewide is 15.1 percent, primarily due to seasonal occupancy.

3.9.2.2 Economic Activity

Elmendorf AFB makes an important contribution to the Anchorage economy through employment of military and civilian personnel and expenditures for goods and services from local businesses. Elmendorf AFB's annual payroll obligates $481 million to its military and civilian employees. In FY2005, the Air Force contributed an estimated $272 million in construction and service contracts and other purchases from local businesses. Elmendorf AFB has a total annual economic impact on the regional economy of over $880 million, supporting 3,060 secondary jobs and generating $128 million in annual secondary income (Air Force 2005d).

Anchorage is the center of commerce for the state of Alaska, an economy driven by four major sectors: oil/gas, military, transportation, and tourism. These sectors have provided a level of stability to the region and contributed to 15 consecutive years of economic growth. A number of industries are headquartered in Anchorage, including oil and gas enterprises, finance and real estate, transportation, communications, and government agencies.

While the unemployment rate is generally low, there are seasonal fluctuations related to resource usage, including commercial fishing and processing activities. Average unemployment in Anchorage was 5.7 percent in 2003, fluctuating between 4.1 percent and 7.4 percent during the period from 1990-2000. In the Anchorage region, total full- and part-time employment increased from 157,120 jobs in 1990 to 188,885 jobs in 2003, at an average annual rate of 1.4 percent (U.S. Bureau of Economic Analysis 2005). The largest employment sectors are government (21.6 percent), retail trade (11.3 percent), and health care and social services (10.6 percent). The military accounts for 11,527 jobs in Anchorage, representing 28.3 percent of government employment and 6.1 percent of total employment. Military employment has steadily declined as a percentage of the region from 11.0 percent of total employment in 1980, to 8.5 percent in 1990, to the current 6.1 percent.

3.9.2.3 Public Services

Daily operation of Elmendorf AFB, and furnishing of services and support to base personnel and family members, is the responsibility of the 3 WG, the base host unit. Off base public services are provided by a number of public and private entities. Police and fire protection services are provided by the Anchorage Police and Fire Departments, respectively. Anchorage Regional Hospital and various medical care providers offer health services in the area. The 3rd Medical Group in collaboration with the Veterans Administration provides hospital and medical care on Elmendorf AFB.

The Anchorage school district serves the Elmendorf AFB population, including three elementary schools, one middle school, and one high school. Elmendorf AFB provides youth programs, teen centers, and childcare services for military families residing and working on base.

3.10 Environmental Justice

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs federal agencies to address environmental and human health conditions in minority and low-income communities. In addition to environmental justice issues are concerns pursuant to EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, which directs federal agencies to identify and assess environmental health and safety risks that may disproportionately affect children.

For purposes of this analysis, minority, low-income and youth populations are defined as follows:

- *Minority Population*: Alaska Natives, persons of Hispanic origin of any race, Blacks, American Indians, Asians, or Pacific Islanders.
- *Low-Income Population*: Persons living below the poverty level.
- *Youth Population*: Children under the age of 18 years.

Estimates of these three population categories were developed based on data from the U.S. Bureau of the Census. The census does not report minority population, per se, but reports population by race and by ethnic origin. These data were used to estimate minority populations potentially affected by implementation of the Proposed Action. Low-income and youth population figures also were drawn from the Census 2000 Profile of General Demographic Characteristics.

3.10.1 Definition of the Resource

Elmendorf AFB is situated in south-central Alaska, just north of Anchorage. Socioeconomic activities associated with the base are concentrated in the Municipality of Anchorage, which comprises the ROI for this analysis. Environmental Justice characteristics are addressed for the base population, when available, and for the Municipality of Anchorage. In addition, the area of land situated outside the Elmendorf AFB boundaries but within the new 65 L_{dn} noise contour

is addressed. The two affected geographic areas comprise a total 31.3 acres and, due to their industrial and rural nature, do not have permanent residents within the 65 dB contours.

3.10.2 Existing Conditions

To comply with EO 12898, ethnicity and poverty status in the vicinity of Elmendorf AFB were examined and compared to state and national data. Minority persons represent 30.1 percent of the Municipality of Anchorage population (U.S. Bureau of the Census 2000). Alaska Natives account for most of the minority population in Anchorage, representing 7.0 percent of the total population and 23.4 percent of the minority population. By comparison, minority persons represent 32.4 percent of the state population, with Alaska Native accounting for 47.5 percent of the state minority population.

The incidence of persons and families in the Municipality of Anchorage with incomes below the poverty level was comparable to state levels. In Anchorage during 2000, 7.3 percent of persons were living below the poverty level, compared to 9.4 percent of persons in the state and 12.4 percent of persons in the nation (U.S. Bureau of the Census 2005).

To comply with EO 13045, the number of children under age 18 was determined for the vicinity of Elmendorf AFB and compared to state and national levels. In 2000, there were 75,742 children age 17 and under residing in Anchorage, comprising 29.1 percent of the population. This compares to 30.4 percent for the State of Alaska and 25.7 percent for the nation.

4.0 176TH WING BEDDOWN AT ELMENDORF AFB ENVIRONMENTAL CONSEQUENCES

This chapter analyzes potential environmental consequences from the proposed beddown of the 176 WG at Elmendorf AFB. As in Chapter 3.0, the expected geographic scope of potential environmental consequences is identified as the ROI. This chapter considers the direct and indirect effects of the Proposed Action and No Action Alternative described in Chapter 2.0. The *Existing Conditions* (refer to Chapter 3.0) of each relevant environmental resource is described to give the public and agency decision makers a meaningful point from which they can compare potential future environmental, social, and economic effects. Cumulative effects are discussed in Chapter 5.0.

4.1 Airfield and Airspace Management

4.1.1 Proposed Action

Elmendorf AFB is often described as being "eight hours from anywhere" and supports a massive airfield operational capacity. Under the Proposed Action airfield operations and flight operations in the vicinity of Elmendorf AFB would remain within current levels. C-130-type aircraft involved with the Proposed Action would functionally replace Air Force C-130 aircraft recently departed. Within the context of existing host, tenant, and transient aircraft operating at Elmendorf AFB, the moving of 5 HH-60G helicopters from Kulis ANGB to Elmendorf AFB would result in no discernable increase in activity. Under the Proposed Action, HH-60G airfield operations would be separated from fighter operations by Runway 16/34 and adjacent to areas providing ground support to C-130 and C-17 aircraft. Visual Flight Rule (VFR) procedures would be employed in proximity to the proposed helicopter pad. Once helicopters depart, they would operate under existing Elmendorf IFR procedures. Beddown of the 176 WG at Elmendorf AFB would not result in any modifications to Elmendorf Tower or AATA procedures.

Elmendorf AFB control tower coordinates closely with the AATA to support military and civil aviation in the region. An example of this cooperation was the tight turning pattern applied to the 7,500 foot north-south runway while the 10,000 foot main runway was resurfaced during 2005. This pattern, instituted by Elmendorf Tower, reduced any potential for encroachment on Merrill Field, south of the runway. Under the proposed beddown of aircraft, Elmendorf AFB would continue to work closely with AATA. All aircraft associated with the Proposed Action

currently operate in this same airspace. The overall effect would be no discernible impact to airspace management and ATC.

4.1.2 No Action Alternative

Under the No Action Alternative, the 176 WG and its associated aircraft would not beddown at Elmendorf AFB. There would be no resumption of airfield operations associated with departed Air Force C-130 aircraft; this would result in a decrease in airfield operations below baseline conditions.

4.2 Noise

4.2.1 Proposed Action

The beddown of the 176 WG under the Proposed Action would result in the airfield sortie operations of 15 C-130-type aircraft (12 C-130H and three HC-130N) and five HH-60G helicopters replacing operations of 18 C-130 aircraft. Levels of airfield activity would be comparable to existing conditions at Elmendorf AFB. The most recent noise analysis for Elmendorf includes both C-130 aircraft with the 517th Airlift Squadron (517 AS) and 36 F-22A aircraft scheduled to beddown by 2011. Since this analysis, the C-130 aircraft with the 517 AS have departed under a separate action. Based on L_{dn} noise exposure contours projected for conditions prior to implementation of the Proposed Action, no discernable changes in noise associated with the proposed beddown are expected. The C-130s and HH-60Gs associated with the Kulis ANGB move to Elmendorf AFB would be projected to have essentially the same noise contours as those on Figure 3.2-1.

Short-term noise increases due to construction and renovation, as well as infrastructure (storm water and electric lines) installment and realignment would occur. Construction occurs in stages; the earlier stage entails trucks, bulldozers, and other heavy construction equipment for the major construction projects (e.g., hangars, aircraft parking facilities, apron). This stage of construction would be temporary and isolated to those areas where construction would occur. Later stages of construction involve less heavy equipment, are also temporary, and occur in the same areas. Most of these projects would be undertaken adjacent to the flight line and occupy industrial areas, and would be isolated from any off base communities. In addition, construction would take place during daylight hours and would follow best management practices (BMPs) to minimize noise to any off base receptors. Construction noise would be contained within base environs since most heavy construction would occur near the flight line, where noise would be compatible with ongoing activities.

4.2.2 No Action Alternative

Under the No Action Alternative, the 176 WG and its associated aircraft would not beddown at Elmendorf AFB. With the recent departure of Air Force C-130 aircraft, this would result in a decrease in airfield operations below baseline conditions presented in Figure 3.2-1 and Table 3.2-1.

4.3 Safety

4.3.1 Proposed Action

The 176 WG beddown would essentially replace C-130 aircraft that have been in the Air Force inventory for decades at Elmendorf AFB. Pilots and maintenance personnel for HH-60G aircraft at Kulis would continue to monitor and fly the HH-60G aircraft. Scheduled beddown of aircraft associated with other actions and beddown of the 176 WG under the Proposed Action will require new Air Installation Compatible Use Zone (AICUZ) analysis and the identification of helicopter CZs. Elmendorf AFB aircraft ground safety conditions would not be expected to change as a result of the 176 WG beddown.

The overall potential for bird-aircraft or wildlife strikes would be expected to effectively remain the same as baseline conditions. The 176 WG aircraft will continue to fly in the manner it has at its current location and comparable to the C-130 aircraft departed from Elmendorf AFB.

Other Elmendorf activities, including the construction of new buildings and facilities under the Proposed Action would not take place in CZs or APZs. The construction would be consistent with the Base General Plan and construction safety procedures would be part of all construction planning and activity. 176 WG operations would have no effect on current QD arcs.

4.3.2 No Action Alternative

Removal of the Air Force C-130 and no beddown of 176 WG aircraft at Elmendorf would reduce the number of aircraft at Elmendorf AFB by 18 C-130s. This would minimally reduce safety risks at Elmendorf AFB.

4.4 Air Quality

4.4.1 Proposed Action

Air emissions resulting from the proposed beddown of the 176 WG were evaluated in accordance with federal, state, and local air pollution standards and regulations. Air quality impacts from a proposed activity or action would be significant if they:

- increase ambient air pollution concentrations above any NAAQS;
- contribute to an existing violation of any NAAQS;
- interfere with or delay timely attainment of NAAQS; or
- impair visibility within any federally mandated federal Class I area.

The approach to the air quality analysis was to estimate any increase in emission levels due to the proposed beddown.

According to USEPA's General Conformity Rule in 40 CFR Part 51, Subpart W, any proposed federal action that has the potential to cause violations in a NAAQS nonattainment or maintenance area must undergo a conformity analysis. Since Elmendorf AFB is in attainment for all criteria pollutants, the anticipated emission resulting from the Proposed Action have

been analyzed and it has been determined that the emissions will not cause or contribute to a new NAAQS violation. Furthermore, a conformity determination is not required as the emissions for all pollutants is below the *de minimis* threshold established by the USEPA in 40 CFR 93.153.

PSD regulations protect the air quality in regions that already meet the NAAQS. The nearest PSD Class I area is approximately 100 miles from the region potentially affected by the Proposed Action. Therefore, the Proposed Action would be unlikely to have a significant impact on any PSD Class I areas.

The Proposed Action would involve the beddown of 15 C-130-type aircraft (12 C-130H and three HC-130N aircraft) and five HH-60G helicopters and associated construction, demolition, grading, and paving projects. Beddown would replace the recently departed 18 C-130 aircraft with the 517 AS scheduled to occur under a separate action.

Construction Emissions. Emissions during the construction period were quantified to determine the potential impacts on regional air quality. Calculations of volatile organic compounds (VOCs), nitrogen oxides (NO_x), CO, and PM_{10} emissions from construction, grading, and paving activities were performed using USEPA emission factors compiled in the *California Environmental Quality Air Quality Handbook* (South Coast Air Quality Management District 1993), *Calculations Methods for Criteria Air Pollution Emission Inventories* (Jagielski and O'Brien 1994), and *Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations* (O'Brien and Wade 2002). The emission factors for building construction include contributions from engine exhaust emissions (i.e., construction equipment, material handling, and workers' travel) and fugitive dust emissions (e.g., from grading activities). Demolition emissions evaluated include fugitive dust and transport of demolition debris offsite. Site preparation, grading, and trenching emissions include fugitive dust from ground disturbance, plus combustive emissions from heavy equipment during the entire construction period. Paving emissions include combustive emissions from bulldozers, rollers, and paving equipment, plus emissions from a dump truck hauling pavement materials to the site. Estimated emissions that would occur from construction, demolition, grading, paving, and painting activities under the Proposed Action are presented in Table 3.4-5. The emissions shown would occur over the duration of the construction period.

Table 4.4-1. Construction Emissions

Source	EMISSIONS (IN TONS)					
	CO	***VOC***	***NO_x***	***SO_x***	***PM_{10}***	***$PM_{2.5}$***
Construction & Demolition	21.8	6.8	100.3	0.0	7.1	7.1
Grading/Trenching	2.5	0.4	3.5	0.3	0.8	0.8
New Pavement	10.0	2.1	22.1	1.8	1.6	1.6
Total	**34.3**	**9.3**	**125.9**	**2.1**	**9.5**	**9.5**

CO = carbon monoxide; VOC = volatile organic compound; NO_x = nitrogen oxides; SO_x = sulfur oxides; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter

Emissions generated by construction, demolition, and paving projects are temporary in nature and would end when construction is complete. The emissions from fugitive dust (PM_{10}) would be considerably less than those presented in Table 3.4-5 due to the implementation of control measures in accordance with standard construction practices. For instance, frequent spraying of water on exposed soil during construction, proper soil stockpiling methods, and prompt replacement of ground cover or pavement are standard landscaping procedures that could be used to minimize the amount of dust generated during construction. Using efficient practices and avoiding long periods where engines are running at idle may reduce combustion emissions from construction equipment. Vehicular combustion emissions from construction worker commuting may be reduced by carpooling.

Air quality permitting for the relocation of the 176 WG to Elmendorf AFB is expected to be conducted on an individual MILCON project basis.

Actual permit actions, if any, would depend on quantities of pollutants potentially emitted as a result of each project and the determination of who has control, as defined by State of Alaska statutes.

Add/Alter projects that would share existing facilities at Elmendorf AFB would be expected to remain under control of Elmendorf AFB with respect to air quality issues. An example is the Medical Training Facility project under which ANG medical staff would be accommodated at the Elmendorf Hospital. Potential ANG air pollutant emissions associated with this action would need to be included under the permit held by Elmendorf AFB for the hospital. Similarly, other projects determined to be under control of Elmendorf AFB would need to be included in the permit structure for the base. This could require modifying an existing Owner Requested Limit (ORL) permit, adding new ORLs, and similar permitting actions.

Projects that are determined to be under control of the ANG would require a review to determine if a permit is required. It is possible that a minor permit would be necessary to construct a facility.

An ORL limiting the hours of operation of emergency generators and/or limiting quantities of fuel burned for heating hangar space could also be required. All air quality permitting actions would be expected to be routine and not significantly impact the relocation.

Potential air pollutant emissions associated with past projects would be additive towards the threshold requiring New Source Review (NSR) which is a major permitting action. An in-house study is presently being conducted to determine the status of Elmendorf AFB permits with respect to past actions at the base. The results of this study will indicate where the base is vulnerable to NSR and a permitting strategy for the relocation will be developed to avoid these areas. Although permitting under NSR is not impossible, it is desirable to avoid since it could result in significant impacts.

The relocation of the 176 WG would require review under general conformity since the burden of CO within the Anchorage CO maintenance area would be impacted. It is anticipated that the relocation would not cause a 100 tons per year increase in CO emissions within the maintenance area resulting in a Record of Non-applicability.

In general, combustive and fugitive dust emissions would produce localized, short-term elevated air pollutant concentrations, which would not result in any long-term impacts on the air quality in the Anchorage region and AQCR 8. The temporary construction-related emissions of PM_{10} and sulfur oxides (SO_x) would not be expected to adversely impact the air quality or visibility.

Operational Emissions. Air emissions would be expected to be slightly less than current operations, upgrades, improvements and modernization associated with the new facilities and renovations. The new utility equipment would be more efficient and have lower air pollutant emissions than older boilers and heaters at the base. Similarly, new fuel transfer and vehicle maintenance facilities would be constructed with modern equipment designed to minimize air emissions.

Air emissions from stationary and ground-based sources related to aircraft maintenance, including aerospace ground equipment, engine test cells, chemical usage, degreasing, and painting would be expected to be similar to current conditions.

The installation or modification of any air emission sources, such as boiler and heaters, emergency generators, corrosion control, etc., would need to be evaluated on an individual basis with regards to the Title V permits and stationary source regulations applicable to the base.

Aircraft Emissions. Under the Proposed Action, 12 C-130H and three HC-130N aircraft (15 total C-130-type aircraft) would beddown at Elmendorf AFB. In addition, five HH-60G helicopters would beddown. Eighteen C-130 aircraft have departed under a separate action. All of the HH-60G and eight of the C-130 type aircraft associated with the Proposed Action currently operate in the Anchorage Area. Sortie operations would remain the same; origin would shift to Elmendorf AFB from Kulis ANGB. Emissions from aircraft operations at the base, including those related to landings and take-offs, touch-and-goes, and low approaches, would reflect mission requirements of the 176 WG. However, because the 176 WG would subsume into the 517 AS C-130 medium lift, search and rescue mission components, sortie operations at Elmendorf would be presumed to be very similar with some fewer C-130 operations and some increase in HH-60G operations. An overall analysis of the relocation to Elmendorf AFB indicates that the Proposed Action will slightly increase emissions at Elmendorf AFB, but will decrease emissions at Ted Steven's airport. The slight increase to Elmendorf AFB emissions will not be a threat to human health at any time, and all emissions will be regulated by the Alaska Department of Environmental Conservation air quality permitting requirements as necessary. No changes in air quality in the Anchorage area or in AQCR 8 would occur under the Proposed Action.

Indirect Emissions. Implementation of the Proposed Action would result in no change in the number of personally owned vehicles commuting in the Anchorage area. The shift in traditional guardsmen's personally owned vehicle operation to Elmendorf AFB would result in an increase in weekend traffic at the base. This would be balanced by a reduction in traffic in the vicinity of Ted Stevens International Airport that will result from the closure of Kulis ANGB under BRAC 2005.

4.4.2 No Action Alternative

Under the No Action Alternative, the 176 WG would not beddown at Elmendorf AFB. No construction emissions would occur and operational emissions would be comparable with baseline conditions with scheduled aircraft.

4.5 Physical Resources

4.5.1 Proposed Action

Earth Resources. Construction of facilities to support the Proposed Action would disturb approximately 21.28 acres in an area that was previously disturbed with the initial construction of the base. Approximately 9.4 acres consist of herbaceous vegetation with small patches of 50 to 60 year old second growth birch and alder timber north of Airlifter Drive. The area north of the east-west runway identified for development of the 176 WG Area of Operations is flat with extensive pre-existing development, pavement, gravel parking areas, and road corridors. The northern margin of this area engages the southern edge of the Elmendorf Moraine and slopes up from the proposed realignment of Airlifter Drive. During construction, ground surface would be cleared of existing vegetation, graded, and prepared for the installation of subsurface utilities and building foundations. Steeper terrain on the north side of the site may require some cut and fill to establish an appropriate building or paving grade. All facilities would be designed and constructed to meet seismic design standards for the base. Since more than one acre would be disturbed by construction, a construction NPDES storm water permit would be required. Under the permit, the base must develop a site-specific SWPPP that describes BMPs to be implemented to eliminate or reduce sediment and non-storm water discharges. With proper design and implementation of the SWPPP, impacts from erosion and off-site sedimentation would be negligible.

Water Resources. Construction of the facilities that would support the beddown of the 176 WG under the Proposed Action would generate storm water runoff from the construction for a four-year time span. Runoff from these construction areas could contain contaminants that would degrade the quality of receiving waters. Once the facilities are constructed, storm water from the new impervious surfaces would be directed to open areas by sheet flow or swales for percolation into the shallow aquifer.

The overall Elmendorf AFB SWPPP identifies erosion control practices to be followed for exposed soil surfaces. These standard erosion control practices include the use of mulch or artificial cover where repeated disturbance is expected and stabilization of soil within 30 days of final disturbance through vegetative or permanent artificial means (e.g., paving or rip-rapping). Although most of the proposed project area is flat or gently sloping to the south, the northern portion of the site slopes up more steeply as it overrides the southern edge of the Elmendorf Moraine. Segments of this area are proposed for development as vehicle parking areas and would require cut and fill to achieve level grade. Here the project area has a potential for gullying and rill erosion during construction. With adherence to BMPs, adverse effects from erosion would be avoided. Cut and fill activities would not be so extensive as to affect subsurface hydrology or penetrate aquifers.

The Air Force would ensure that construction activities are conducted in accordance with the applicable storm water discharge permit for any areas that result in soil disturbance. Site-specific management plans and BMPs would be implemented to control erosion and prevent sediment, debris or other pollutants from entering storm water during site activities.

Once facility construction is completed and operations commence, the base's SWPPP also specifies procedures for spill prevention and response, routine inspection of discharges at sites, and proper training of employees. With implementation of BMPs, impacts to surface water quality at Elmendorf AFB would not be considered significant.

Hazardous Materials. Existing procedures for the centralized management of the procurement, handling, storage, and issuing of hazardous materials through the HAZMART are adequate to handle the changes anticipated with the beddown of the 176 WG, but would be expanded to meet the increased use. Construction of the 176 WG facilities may require the use of hazardous materials by contractor personnel. Project contractors would comply with federal, state, and local environmental laws and would employ affirmative procurement practices when economically and technically feasible.

All hazardous materials and construction debris generated by the proposed project would be handled, stored, and disposed of in accordance with federal state and local regulations and laws. Permits for handling and disposal of hazardous material would be coordinated by the contractor with the base hazardous waste program manager. The use of hazardous materials would not cause adverse impacts. Renovation of existing facilities have the potential to remove asbestos-containing materials and lead-based paint thereby reducing exposure pathways for personnel.

In the event of fuel spillage during demolition or construction, the contractor would be responsible for its containment, clean up, and related disposal costs. The contractor would have sufficient spill supplies readily available on the pumping vehicle and/or at the site to contain any spillage. In the event of a contractor related release, the contractor will immediately notify the Base Fire Department at 907-552-SPIL (7745). The Fire Department will then notify the Environmental Flight who will report the spill to Alaska Department of Environmental Conservation.

A JP-8 fuel supply line crosses the northern portion of the area proposed for vehicle parking under the Proposed Action. This supply line would cross the entire area from west to east. Construction development and grading would be implemented to follow established procedures and avoid impacts to this fuel supply line.

Additionally, a 14-inch water supply line runs parallel to the above mentioned fuel supply line upslope from the proposed project area. As currently sited, project elements associated with the Proposed Action would be developed to the south of this water supply line and avoid this area.

Hazardous Waste. Elmendorf AFB would continue to generate hazardous wastes during various operations and maintenance activities. Hazardous waste disposal procedures, including off base disposal procedures, are adequate to handle changes in quantity and would remain the same. The base's OPlan 19-3 would be updated to reflect any changes of hazardous waste generators and waste accumulation point monitors. The number of hazardous waste

accumulation sites would be modified to handle the change in waste generation and there would be no adverse impacts. In the event that any hazardous wastes are generated as a result of C-130 or HH-60G maintenance activities that present any unique hazards over those generated by the previous C-130 aircraft, Elmendorf AFB would implement appropriate hazardous waste control procedures to minimize potential risks to personnel and the environment.

Environmental Cleanup. The Proposed Action construction and renovation of nine facilities would likely require work within 200 feet of environmental sites.

SD-24 and Hangar 10 Plume are located near Hangar 10, the proposed location of the Alter Alert Helicopter Maintenance Hangar project. Although no remediation may be required at this site, residual soil contamination may be encountered during excavation within the limits of SD-24.

SD-25, Hangar 11 Plume, ST-64, ST-421, and ST-522 are located near Hangar 11, the proposed location of the Alter Alert Helicopter Hangar, Corrosion Control Complex, Wing Operations and Training Facility, Pararescue Operations Complex, and Construct Infrastructure and Utilities projects.

SD-27 and Hangar 10 Plume are located near Building 15431, the proposed location of the Aircraft Support Equipment Shop.

SD-30 and Fairchild Plume are located near Building 6211, the proposed location of the Logistics Readiness Squadron/Vehicle Maintenance Flight project.

SA-99 is located across Arctic Warrior Drive from Hangar 18, the proposed location of the Operations Group and Operations Group Maintenance Alter projects.

Kenney Avenue Plume is located near the Civil Engineer Squadron and the Security Forces Squadron/Combat Arms Training Maintenance projects.

The Fairchild and OU5MW-02 Plumes are located near Building 4251, the proposed location of the LRS/Base Supply project.

The locations of soil contamination and groundwater contamination in these areas is approximated based upon the most current soil boring and groundwater monitoring results. It is likely that soil and groundwater contamination would be encountered during construction at any of these sites. Locating sources of pre-existing contamination would be beneficial to the Elmendorf Environmental Program but would increase the estimated costs of projects. The Environmental Program would be impaired if monitoring wells were damaged or destroyed or if land use controls were not followed. Project design and coordination with the Environmental Office prior to any construction would occur to ensure that ongoing Environmental Program remediation or investigation activities are not impaired.

4.5.2 No Action Alternative

Under the No Action Alternative the 176 WG would not beddown at Elmendorf AFB. No construction, renovation, or improvement projects would occur. No ground disturbing activities would take place.

4.6 Biological Resources

4.6.1 Proposed Action

Four areas of consideration are used to identify the potential environmental consequences to wildlife and habitat. These areas are (1) the importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource; (2) the proportion of the resource that would be affected relative to its occurrence in the region; (3) the sensitivity of the resource to proposed activities; and (4) the duration of any ecological ramifications. Impacts to resources would be considered significant if special-status species or habitats are adversely affected over relatively large areas or disturbances cause significant reductions in population size or distribution of a special-status species (40 CFR 1508.2).

Specific concerns for biological resources within the base environs ROI are habitat loss due to construction of new facilities, noise associated with construction, and noise associated with the operation and maintenance of the aircraft associated with the 176 WG at Elmendorf AFB. Concerns for species near Elmendorf AFB include noise and potential run-off to water resources from construction or operation.

Under the Proposed Action, 21.2 acres would be affected by building construction and renovation, infrastructure improvements, and new paving associated with personally owned vehicle parking, road realignment, and a new C-130 apron. Much of this area would be involved in the creation of a dedicated 176 WG Area of Operations north of the east-west runway in an area previously occupied by C-130 aircraft with the 517 AS. Some satellite facilities would be renovated or constructed in other areas within the developed portion of Elmendorf AFB. Construction of an updated and expanded C-130 apron would involve 7.5 acres of previously disturbed area supporting some ruderal vegetation. An additional 7.5 acres would be required for the construction of new vehicle parking and the realignment of Airlifter Drive. Some new facility construction totaling 1.8 acres would occur north of the realigned Airlifter Drive. Areas to the north of the current alignment of Airlifter Drive are dominated by patchy second growth timber stands. Under the Proposed Action, development activities in this area would result in the removal of approximately 9.4 acres of vegetation supporting two small patches of 50 to 60 year old second growth trees. This forested area is composed of paper birch (*Betula papyrifera*), aspen (*Populus tremuloides*), and scouler willow (*Salix scouleriana*). The fairly open canopy is intermixed with areas that have been previously cleared of trees for pipeline rights-of-way and access trails. The result is a lush understory that includes highbush cranberry (*Viburnum trilobum*), sitka alder (*Alnus viridis*), prickly rose (*Rosa acicularis*), and various grasses and forbs. Additionally, a section of the proposed realignment of Airlifter Drive would affect a band of small trees planted as part of an Elmendorf AFB revegetation project. Although a small pond is located to the north and west of the proposed project area, it is well upslope of the site and no wetlands would be disturbed or lost. Useable

hardwood timber (birch) that would be cleared for the Proposed Action will be separated, limbed, and stacked for permitted firewood cutters. Following construction, cleared areas would be landscaped according to base guidance. Construction plans would specify fugitive soil and dust control to prevent run-off into water resources. No wetlands would be disturbed or lost.

Wildlife species affected by loss of forest include red squirrel and several bird species, including ruby-crowned kinglet, American robin, Swainson's thrush, slate-colored junco, myrtle warbler, orange-crowned warbler (*Vermivora celata*), and common redpoll. These species may be displaced or disturbed by construction, but would be expected to move elsewhere on the base. Effects would not be expected to be significant.

Cook Inlet beluga whales, a species recently proposed for listing as endangered under ESA occur seasonally in waters of Elmendorf AFB. Although studies suggest these whales may react to aircraft overflight noise, they are regularly encountered in nearshore waters beneath both Elmendorf AFB and Ted Stevens International Airport approaches (National Oceanic and Atmospheric Administration National Marine Fisheries Service 2003). No changes in noise contours would occur under the Proposed Action. HH-60G helicopters would depart their operations area over land to the northeast for training and search and rescue missions. Aircraft operations under the Proposed Action would have no effect on Cook Inlet beluga whales.

Five special-status bird species may occur at Elmendorf AFB. The peregrine falcon, gray-cheeked thrush, and Townsend's warbler would be unlikely to inhabit the developed and affected portions of Elmendorf AFB. Small numbers of olive-sided flycatcher and blackpoll warbler may occur in the forest stand in the southeast part of the base. Clearing marginal roadside habitat during breeding season could disrupt some nesting birds but would not be expected to affect any special status species.

4.6.2 No Action Alternative

Under the No Action Alternative, the 176 WG would not beddown at Elmendorf AFB; no associated construction, renovation, or modernization projects would occur; a 176 WG Area of Operations would not be established. No impacts to biological resources are expected under the No Action Alternative.

4.7 Cultural Resources

A number of federal regulations and guidelines have been established for the management of cultural resources. Section 106 of the NHPA, as amended, requires federal agencies to take into account the effects of their undertakings on historic properties. Historic properties are cultural resources that are listed on, or eligible for listing on, the NRHP. Eligibility evaluation is the process by which resources are assessed relative to NRHP significance criteria for scientific or historic research, for the general public, and for traditional cultural groups. Under federal law, impacts to cultural resources may be considered adverse if the resources have been determined eligible for listing in the NRHP or have been identified as important to Alaska Natives as outlined in the *American Indian Religious Freedom Act* and EO 13007, *Indian Sacred Sites*. DoD Alaska Native Policy (1999) provides guidance for working with federally-recognized Alaska

Native governments. DoD policy requires that installations provide timely notice to, and consult with, tribal governments prior to taking any actions that may have the potential to significantly affect protected Alaska Native resources, rights, or lands.

Analysis of potential impacts to cultural resources considers direct impacts that may occur by physically altering, damaging, or destroying all or part of a resource; altering characteristics of the surrounding environment that contribute to the resource's significance; introducing visual or audible elements that are out of character with the property or alter its setting; or neglecting the resource to the extent that it deteriorates or is destroyed. Direct impacts can be assessed by identifying the types and locations of proposed activity and determining the exact location of cultural resources that could be affected. Indirect impacts generally result from increased use of an area.

4.7.1 Proposed Action

Within the environs of Elmendorf AFB, the Proposed Action would develop new facilities and alter other facilities in order to relocate the 176 WG of the AKANG to Elmendorf AFB. Beddown of the 176 WG at Elmendorf would involve the placement of 12 C-130H, three HC-130N, and five HH-60G aircraft; construction of new facilities; renovation or modification of some existing facilities; and replacement of support equipment. The 15 C-130-type aircraft involved in the beddown would replace 18 C-130 aircraft recently departed from Elmendorf AFB. The Proposed Action would include 22 construction, renovation, or infrastructure improvement projects to be implemented between 2007 and 2010. Most of the projects would be concentrated in the northeastern section of Elmendorf AFB, although some projects will occur in other areas of the base (Figure 2.1-1). The Proposed Action would renovate or alter one structure built during World War II (Building 5312), seven structures built during the Cold War, (Buildings 10471, 6211, 4251, 15431, 15380, 15455, and 16430), and five structures built after the termination of the Cold War (Buildings 4309, 11673, 15510, 17470, and 7252) (refer to Table 4.7-1).

Building 5312, scheduled for renovation, is located in the Alaska Air Depot Historic District and is eligible for the NRHP. Building 15380, although less than 50 years old, would need to be evaluated for possible NRHP inclusion on the merit of a Cold War era association before renovation. Six of the buildings proposed for alteration or renovation are 50 years old and would need to be evaluated for possible inclusion on the NRHP under any of the eligibility criteria.

Table 4.7-1. Structures Proposed for Alteration

Project Description	*Project Type*	*Building Number*	*Construction Date*	*NRHP Status*
FY2008 Projects				
Alter Helicopter Maintenance Hangar 10//Forward Supply Point	Alteration	15455	1957	Unevaluated
Alter Alert Helicopter Hangar	Alteration	16430	1957	Unevaluated
FY2009 Projects				
Civil Engineer Squadron	Alteration	5312	1944	Eligible
Communications Flight	Alteration	10471	1950	Unevaluated
LRS/Vehicle Maintenance Flight	Alteration	6211	1953	Unevaluated
Logistics Readiness Squadron (LRS)/Base Supply	Alteration	4251	1954	Unevaluated
Aircraft Support Equipment	Alteration	15431	1956	Unevaluated
Aerial Port Flight	Alteration	15380	1988	Unevaluated
Security Forces Squadron/Combat Arms Training Maintenance (CATM)	Alteration	4309	1991	Not Eligible
LRS/Fuels Management Flight	Alteration	11673	1993	Not Eligible
Combat Readiness and Resources Flight and Wing Plans	Alteration	15510	1995	Not Eligible
Operations Group and Maintenance	Alteration	17470	1999	Not Eligible
Security Forces Complex	Alteration	7252	2003	Not Eligible

Source: Air Force 2003b

The Proposed Action has the potential to impact historic properties if consultation with the SHPO determines that renovations to Building 5312 will affect the eligibility of this NRHP-eligible structure, or if any of the other structures are eligible for the NRHP and renovations would affect their NRHP eligibility. Additionally, there is one NRHP-eligible structure (15512) in the northeastern section of Elmendorf AFB where most of the new construction projects would be located. However, compliance with Section 106 of the NHPA, including SHPO consultation regarding NRHP eligibility and potential effects to buildings that are eligible or that may be found to be eligible, has been initiated and will be completed prior to the implementation of the Proposed Action (Appendix C). Figure 3.7-1 depicts the NRHP structures. All ground-disturbing activities have a possibility of encountering previously unrecorded and unknown archaeological resources. If suspected artifacts of any type (wood, stone, bone, metal, etc.) or other unidentifiable materials are inadvertently uncovered during ground disturbing activities, the soil disturbance activities in that area must cease until environmental staff can determine whether or not the materials warrant further actions under

the Native American Graves Protection and Repatriation Act, Archeological Resources Protection Act, or the NHPA. The Cultural Resources Manager will ensure that Integrated Cultural Resources Management Plan (ICRMP) procedures are implemented (Air Force 2003b). The 2003 ICRMP is under revision; the revised ICRMP is anticipated to be finalized early in 2008.

If human remains are discovered in the course of excavation on the base, the work resulting in the discovery should stop, and the individual implementing the work (e.g., the non commissioned officer in charge or job foreman) will immediately notify the Cultural Resources Manager of the find, who will ensure that ICRMP procedures are implemented (Air Force 2003b). Specific base policies can be found in the 3rd Wing Policy, *Base Policy When Encountering Human Remains.*

4.7.2 No Action Alternative

Under the No Action Alternative, the 176 WG of the AKANG would not relocate at Elmendorf AFB. Construction associated with the beddown would not occur and impacts to cultural resources would not be expected under this alternative. In all cases, resources would continue to be managed in compliance with federal law and Air Force regulation.

4.8 Land Use and Transportation

As described in Chapter 2.0, the key elements of the proposal are facility construction and renovations and personnel changes. Established and recognized noise models have been applied to estimate the off base and on base noise conditions. For the land use and transportation resources, consequences are associated with any potential changes in noise due to change in aircraft capability. Potential effects to land use plans, land use patterns, and circulation due to construction or personnel increases are considered.

4.8.1 Proposed Action

Under the Proposed Action, the total geographic area exposed to L_{dn} 65 or more would be basically the same as under scheduled (baseline) conditions. The area affected by noise anticipated under the Proposed Action is presented on Figure 3.2-1. This area includes a portion of the Knik Arm, a portion of the Port of Anchorage, and a portion of the Port MacKenzie area across the Knik Arm. The proposed noise environment should not result in changes to land management, land use, or land ownership.

The DoD and FAA adopted the concept of land use compatibility as an accepted measure of aircraft noise effect. USEPA has reaffirmed these concepts (see Section 3.2). The FAA has guidelines that establish the best means for determining noise impact in airport communities. Industrial land uses, such as ports, are compatible within the 65 dB noise contours.

4.8.2 No Action Alternative

Under the No Action Alternative, the 176 WG would not beddown at Elmendorf AFB. Project-related construction, renovation, or improvement projects would occur.

4.9 Socioeconomics

Existing population and employment characteristics in Anchorage were analyzed to assess the potential socioeconomic impacts of the proposed beddown, as presented in Section 3.9. The Proposed Action, described in detail in Chapter 2.0, involves two factors that may affect socioeconomic resources: personnel changes and facility modification. The anticipated net change in base employment amounts to an increase of 1,240 personnel. Facility modifications associated with the 176 WG beddown consist of a series of construction, renovation, and infrastructure improvement projects of approximately three years.

Socioeconomic impacts would occur if changes substantially affected demand for housing or community services, such as schools, or substantially affected economic stability in the region. The potential population, employment, income, and output impacts are estimated and quantified to determine their potential effect on the region.

4.9.1 Proposed Action

Construction Impacts

Under the Proposed Action, a total of 22 construction, renovation, or infrastructure improvement projects would be implemented over the period from 2007 to 2010. Total estimated cost of facility requirements under the Proposed Action is $160 million. Potential direct economic activity is estimated to be approximately 750 construction jobs for the total construction costs, or approximately 190 jobs per year during the estimated four year construction period. The Alaska-Matsu region (as defined by U.S. Census Bureau) has approximately 10,000 construction workers and, although the construction activity would contribute to the overall economic activity, an average of 190 annual construction jobs generated by the beddown would not be a significant contribution to the regional economy.

Operational Impacts

Beddown of the 176 WG would require personnel to operate and maintain the aircraft and provide necessary support services. Total personnel would increase by a net of 1,140 positions. This is comprised of approximately 340 full-time and 800 traditional ANG personnel. This increase would represent approximately 12 percent of the base employment.

Although there will be an increase in personnel, it is not expected to have an impact because the personnel are already located in Anchorage. Therefore, housing and community services are not expected to change. Elmendorf AFB is a dynamic installation with regular changes in missions and personnel. The proposed change in base employment is not expected to be noticed in the overall base dynamics.

4.9.2 No Action Alternative

No Action would not beddown the 176 WG aircraft at Elmendorf AFB. An estimated 1,140 full- and part-time National Guard positions would not relocate from Kulis to Elmendorf. The total of 188,885 jobs in the Anchorage region would not be affected (U.S. Bureau of Economic Analysis 2005).

4.10 Environmental Justice

4.10.1 Proposed Action

Disadvantaged groups within the general vicinity of Elmendorf AFB including minority, low-income, and youth populations, do not represent a disproportionate segment of the population. The facility modifications and personnel changes associated with the Proposed Action are not expected to create significantly adverse environmental or health effects. There would be no disproportionate impact upon children.

4.10.2 No Action Alternative

No Action would not beddown the 176 WG aircraft at Elmendorf AFB and impacts to disadvantaged groups or children within the general vicinity of Elmendorf AFB are not expected to occur under this alternative.

5.0 CUMULATIVE IMPACTS

5.1 Cumulative Effects Analysis

The CEQ regulations stipulate that the cumulative effects analysis in an EA considers the potential environmental consequences resulting from "the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Chapter 3.0 discussed the baseline conditions of the proposed 176 WG beddown on environmental resources at Elmendorf AFB. Chapter 4.0 discusses potential effects and potential consequences. Chapter 5.0 identifies and evaluates projects that are reasonably foreseeable that could cumulatively affect environmental resources in conjunction with the 176 WG beddown at Elmendorf AFB.

Assessing cumulative effects begins with defining the scope of other actions and their potential interrelationship with the Proposed Action or alternatives (CEQ 1997). The scope must consider other projects that coincide with the location and timetable of the Proposed Action and other actions. Cumulative effects analyses evaluate the interactions of multiple actions. The first steps of the environmental impact analysis process helped identify other potential and planned actions. During early community outreach efforts, agencies were asked to provide information about ongoing regional projects and the potential interaction of the 176 WG beddown at Elmendorf AFB with such projects. These initial discussions defined the ROI, which in turn defined what actions should be considered cumulatively. The ROI for cumulative effects would have both spatial and temporal dimensions.

The CEQ (1997) identified and defined eight ways in which effects can accumulate: time crowding; time lag; space crowding; cross boundary; fragmentation; compounding effects; indirect effects; and triggers and thresholds. Furthermore, cumulative effects can arise from single or multiple actions, and through additive or interactive processes (CEQ 1997).

Actions not identified in Chapter 2.0 as part of the proposal, but that could be considered as actions connected in time or space (40 CFR 1508.25) (CEQ 1997) may include projects that affect areas on or near Elmendorf AFB, areas underlying the affected training airspace, as well as the airspace itself. This EA analysis addresses three questions to identify cumulative effects:

1. Does a relationship exist such that elements of the project alternatives might interact with elements of past, present, or reasonably foreseeable actions?
2. If one or more of the elements of the alternatives and another action could be expected to interact, would the alternative affect or be affected by impacts of the other action?
3. If such a relationship exists, does an assessment reveal any potentially significant impacts not identified when the alternative is considered alone?

An effort has been made to identify all actions that are being considered and that are in the planning phase at this time. To the extent that details regarding such actions exist and the actions have a potential to interact with the proposal, these actions are included in this cumulative analysis. This approach enables decision-makers to have the most current information available so that they can evaluate the environmental consequences of the Proposed Action.

5.1.1 Past, Present, and Reasonably Foreseeable Actions

This EA applies a stepped approach to provide decision-makers with not only the cumulative effects of the Proposed Action, but also the incremental contribution of past, present, and reasonably foreseeable actions.

5.1.1.1 Elmendorf AFB and Other Military Actions

Recent past and ongoing military action in the region were considered as part of the baseline or existing condition in the ROI. Each project (summarized in this section) was reviewed to consider the implication of each action and its synergy with the Proposed Action. Of particular concern were potential overlap in affected area and project timing. Shared aircraft operations were also a consideration.

Elmendorf AFB is an active military installation that experiences continuous and rapid evolution of mission and training requirements. This process of change is consistent with the U.S. defense policy that the Air Force must be ready to respond to threats to American interest throughout the world. Any new construction must comply with land use controls.

The base, like other major military installations, also requires new construction, facility improvements, and infrastructure upgrades. Table 5.1-1 lists potential major construction projects anticipated to occur on the base. Table 5.1-2 lists current and anticipated future off base military and non-military projects.

5.1.1.2 Non-Federal Actions

Non-federal actions include projects of the State of Alaska, various cities within the ROI, and private projects. The Municipality of Anchorage is a large urban area with multiple construction projects occurring, especially in the summer months. Specific major actions within the vicinity of Elmendorf AFB are summarized in Table 5.1-2.

5.1.2 Cumulative Effects Analysis

Airspace Management and Air Traffic Control

Beddown of the C-17 at Elmendorf AFB in combination with the BRAC action of moving ANG C-130 aircraft from Kulis ANGB will increase Elmendorf AFB tower responsibilities. These actions should not substantially affect the AATA management of Anchorage airspace.

Table 5.1-1. Potential Major Projects at Elmendorf AFB

Scheduled MILCON Projects	*FY*
Construct Air Force/Joint PME Center ($25M PA for Joint)[1]	2008/09
Construct North Side Dining/In-Flight Kitchen	2009
Construct Automated Vehicle Wash/Vehicle Operations[1]	2009
Joint Regional Fire Training Facility[1]	2008/09
Construct 962 AACS Hangar	2010
Renovate People Center	2011
Construct Security Force Squadron Compound	2011
Repair Hangar 3	2011
Construct Fire Station 1	2012
Repair Hangar 2	2012
Construct Combat Alert Cells	2012
Construct New Avionics[1]	2013
Construct Visiting Quarters	2013
Construct Base Chapel	2013
Base Fire Station 6	2013
Simulator Train Center	2014
Upgrade 10471 Communications	2014
Upgrade 10480 3 Aircraft Maintenance Squadron	2014
Aircraft Maintenance Squadron Maintenance Group Headquarters	2015
Base Civil Engineering Compound	2015
Construct Entomology Facility[1]	2015
New Dormitory	2016
611th Civil Engineering Squadron Compound	2016
611th Air Operations Group/Air Support Group Headquarters	2017
Construct Transportation Compound	2018
Construct Communications Compound	2019
Composite Operations Support Squadron Facility	2019
PACAF Band Facility	2019
Repair Arctic Utilities and Infrastructure, Phase 1/10[1]	2009
Repair Arctic Utilities and Infrastructure, Phase 2/10[1]	2010
Repair Arctic Utilities and Infrastructure, Phase 3/10	2011
Repair Arctic Utilities and Infrastructure, Phase 4/10	2012
Repair Arctic Utilities and Infrastructure, Phase 5/10	2013
Repair Arctic Utilities and Infrastructure, Phase 6/10	2014
Repair Arctic Utilities and Infrastructure, Phase 7/10	2015
Repair Arctic Utilities and Infrastructure, Phase 8/10	2016
Repair Arctic Utilities and Infrastructure, Phase 9/10	2017
Repair Arctic Utilities and Infrastructure, Phase 10/10	2018

Note: 1. Project on Fiscal Year Defense Plan

Table 5.1-2. Current and Future Military and Non-Military Projects
(Page 1 of 3)

Action	*Document*	*Description*
Military Projects		
C-17 Beddown	Final EA Elmendorf AFB, AK September 2004	The addition of new C-17 aircraft brings the Air Force Alaska airlift capabilities to state-of-the-art standards and increases its capacity. The project is underway and involves the recent departure of 18 C-130 cargo aircraft, beddown of 8 new C-17 aircraft, routine aircraft operations (both mission- and training-related), and the construction and use of support facilities on Elmendorf AFB. The C-130 aircraft departed Elmendorf AFB in early 2007 and the C-17 aircraft are scheduled to arrive in mid 2007. New facilities would be constructed in a phased approach in an effort to minimize impacts to normal base operations.
C-17 Training Areas	Final EA Elmendorf AFB, AK November 2005	The C-17 training area project involves C-17 operations in Alaskan Special Use Airspace. The project also includes upgrading Runway 06/24 at Allen Army Airfield, frequent use of the runway as a C-17 assault landing zone, and frequent use of five existing drop zones for C-17 training.
F-22A Beddown at Elmendorf AFB	Final EA Elmendorf AFB, AK June 2006	The beddown of the F-22A aircraft would replace and supplement the F-15C and F-15E aircraft at Elmendorf AFB scheduled for relocation by BRAC. The project includes several construction and renovation sites to support the new aircraft and personnel.
Transformation of U.S. Army Alaska	Final EIS February 2004	This action is under way and includes accommodation for 4,000 more soldiers relocating from installations worldwide, as well as activation of a new airborne brigade. The action also transforms the 172nd Infantry Brigade into a Stryker Brigade Combat Team. This includes changes to force structure and stationing, and modifications of ranges, facilities, and infrastructure designed to meet the objectives of Army transformation in Alaska. Elmendorf AFB uses Army ranges for air-to-ground training. Proposed locations for changes in force structure and stationing include Fort Wainwright and Fort Richardson. Proposed activity changes on Fort Wainwright would occur within the cantonment area, Tanana Flats Training Area, Yukon Training Area, and Donnelly Training Area.
Fort Richardson/ Elmendorf AFB Joint Basing concept	BRAC 2005 Joint Basing Road Map Study	The Joint Basing Implementation Roadmap Study calls for 3 pilot studies that are currently underway investigating more efficient use of installations that are adjacent to one another but managed by different services (e.g., Army/Air Force, Navy/Air Force). Elmendorf and Fort Richardson, while not the subject of a pilot study, may implement the Joint Basing Concept as early as 2006. The BRAC timeframe extends to 2011. Initial efforts may include shared community service facilities, such as the current medical center. Demand for construction resources may be high.

Table 5.1-2. Current and Future Military and Non-Military Projects
(Page 2 of 3)

Action	*Document*	*Description*
Kulis ANG BRAC projects	Identified as a BRAC action by BRAC 2005 In process	This project closes the 176th ANG Wing facilities at Ted Stevens International Airport. NEPA analysis is underway for this action.
Gravel Pit Expansion	Elmendorf Gravel Pit Expansion Draft EA In process	The pit is located off the east side of the East-West runway on Elmendorf AFB. The pit has been operating since the late 1980s to provide gravel to base operations. A Draft EA is being prepared for the expansion of the gravel pit.
Non-Military Projects		
Knik Arm Crossing	Draft EIS and Section 4(f) Evaluation September 2006	The Knik Arm Bridge and Toll Authority is the proponent of a $400 - $600 million dollar construction effort known as the Knik Arm Crossing Project. If constructed, the Municipality of Anchorage and the Matanuska-Susitna Borough would be linked by a bridge over the Knik Arm. The project has the potential to affect Elmendorf AFB since proposed access routes cross the base. This project is in the early stages of NEPA with field studies occurring within the project area and a preliminary draft EIS out for agency review.
Cherry Hill Gravel Site	Cherry Hill Gravel Extraction EA March 2006	The Cherry Hill Borrow Site is located on Elmendorf AFB. The gravel removal could have some interaction with the construction that might occur on base. Anticipated work at Cherry Hill is expected from 2006 through 2010. The Finding of No Significant Impact/Finding of No Practicable Alternative was signed by the PACAF/CE on 1 March 2006.
Cook Inlet Region, Inc. (CIRI) Retail Development Construction	Municipality of Anchorage Draft site Plan 2007	The Northeast Anchorage Retail Development project site on a 95-acre parcel of land directly adjacent to Elmendorf AFB's Muldoon Gate entrance. The project is being developed in a partnership between Browman Development Company, a California based development company, and CIRI, an Alaska Native corporation. The property is owned by CIRI, with Browman Development Company as the developer. The proposed development includes approximately 950,000 square feet of retail and warehouse space, with phased development through 2015.
Port of Anchorage Expansion	Marine Terminal Redevelopment EA March 2005	The Port of Anchorage is located in close proximity to Elmendorf AFB. There are stages to the expansion project that are expected to span from 2006 to 2011. The construction in the area is expected to increase through all three phases of the project. There is overlap during proposed 176 WG Area of Operations facilities construction.

Table 5.1-2. Current and Future Military and Non-Military Projects
(Page 3 of 3)

Action	*Document*	*Description*
North End Gravel Extension	North End Runway Material Extraction and Transport EA May 2006	This EA analyzes the potential impacts associated with material extraction activities at the North End Borrow Site and potential transportation corridors on Elmendorf, to meet a substantial portion of the fill requirements. A separate but related action proposes to meet the remaining portion of the Marine Terminal Redevelopment Project fill requirements (Cherry Hill Borrow Site). The 284-acre proposed North End Borrow Site is located 3.4 miles northeast of the Port of Anchorage and immediately north of the North/South Runway at Elmendorf. It includes several borrow pits which are currently in use for construction projects within Elmendorf. Approximately 5.7 million cubic yards of recoverable material suitable for use in the Marine Terminal Redevelopment project has been confirmed available at the North End Borrow Site, and an estimated additional 2.8 million cubic yards may be available in uninvestigated areas within the Proposed Action limits. The proposed haul route extends generally westward from the North End Borrow Site to the Port of Anchorage and traverses approximately 3.4 miles of presently unimproved roads and trails on Elmendorf. Approximately 20 acres are presently cleared and are active as borrow material sources. An additional six acres are recovering from previous borrow activities and revegetating with native species. The remaining 258 acres have not been used as a borrow sources and are either cleared to keep vegetation out of the North/South runway's approach clearance surface, or are fully vegetated. The finding of no significant impact was signed by the PACAF/CE on 30 May 2006.
Natural Gas Pipeline	Preliminary discussions between federal and state agencies	Alaska is pursuing the construction of a natural gas pipeline. This possible project is still in the early stages and has not yet received approval. While part of the construction staging and possibly a pipeline extension could occur in the Anchorage area, the construction would not be expected to begin until after the completion of 176 WG Area of Operations facility construction.
Anchorage Municipal Code Revision	Municipality of Anchorage Planning Department Title 21 Public Review Draft #2	Title 21 is a section of the Anchorage Municipal Code regulating land use and development to protect and enhance the public health, safety, and general welfare of the community, and to implement the Anchorage 2020 – Anchorage Bowl Comprehensive Plan. The revision would include development techniques and design standards, support innovative land development, encourage economic development, implement recently adopted plans and policies, and streamline the review process.

Noise

At Elmendorf AFB, noise conditions addressed for the 176 WG beddown take into consideration the C-17 beddown and the F-22A operational beddown. The noise analysis for the 176 WG presented in Section 3.2 is effectively a cumulative analysis (refer to Figure 3.2-1).

Safety

Flight, ground, and explosives safety associated with the 176 WG beddown are not expected to have any cumulative effects in conjunction with other past, present, and reasonably foreseeable actions. None of these actions except the potential bridge access routes could affect safety on the base or in base environs. The Air Force is working with the Knik Arm Bridge and Toll Authority to protect base safety and security. The cumulative effects of the BRAC F-15C and F-15E actions are included in the safety analysis.

Air Quality

Construction projects at Elmendorf AFB (e.g., the new North Side Dining/In-Flight Kitchen, the Automated Vehicle Wash, the new Dorms, the Large Airframe/Nose Dock Hangar) would all add temporary construction emissions due to construction equipment combustion and fugitive dust. Operational emissions would increase as facilities and personnel are added to the base, but would be offset by a removal of older equipment and facilities, and by the increased efficiency and lower emissions of newer equipment.

Implementation of regional projects would add to the total air emissions in the region. The Grady Highway extension potentially lowers operational emissions as vehicles traveling the highway would drive more efficiently with lower traffic congestion. As the area is further developed, the new highway extension could lead to a net increase in overall emissions as it would open the way for further development in areas that are currently undeveloped. The C-17 beddown would result in a temporary increase in construction emissions, and a change in aircraft emissions in the region. The construction would occur in a phased approach to minimize impacts to normal base operations. The transformation of Army Alaska would increase personnel by 4,000 soldiers in the region, with an accompanying increase of payroll, secondary employment, and air emissions. The project includes construction projects, which would temporarily increase construction emissions as well.

Physical Resources

Physical resources at Elmendorf AFB would be affected by the cumulative construction activities on base and at Fort Richardson. Several future construction projects are planned, resulting in increased construction disturbance to soils with potential to affect water resources, hazardous materials, hazardous wastes, or the Elmendorf Environmental Program including ERP. BMPs would reduce the potential cumulative impacts.

Biological Resources

Biological resources at Elmendorf AFB could be affected by cumulative construction activities on base and at Fort Richardson. Several future construction projects are planned, resulting in increased construction noise and disturbance to soils, vegetation, and wildlife. If any of these construction activities occur on undeveloped portions of the base, native vegetation, secondary growth forests, wetlands, or special-status species could be affected. The Proposed Action could result in the removal of approximately 5 acres of forested land within the project area. This forest loss is in addition to forest clearing associated with projects listed in Table 5.1-2. These projects have been or will be subject to the NEPA process and any impacts to biological resources would be identified. Cumulative effects of perimeter fencing has been included in Section 3.6.

Beluga whales in Cook Inlet could be affected by the increasing human activity and construction in the Knik Arm and along the adjacent shoreline. Examples included the Knik Arm Crossing and the Port of Anchorage Expansion.

Cultural Resources

Historic buildings could be demolished; construction or renovation could occur in a NRHP-eligible historic district; and ground disturbance during construction could encounter previously unrecorded archaeological resources. Other unrelated projects in the general vicinity that also have the potential to impact cultural resources could contribute to a cumulative impact.

Four projects, C-17 Beddown, Cherry Hill Gravel Extraction, North End Gravel Extraction, and Kulis ANG BRAC, call for construction activities that could impact archaeological and architectural resources at Elmendorf AFB. The potential for impacts will depend on the type of new facilities and their proximity to architectural resources located in three NRHP-eligible Elmendorf historic districts. There is also the potential for construction related impacts to previously undocumented archaeological resources, should they exist.

Two off-base projects also have the potential to contribute to cumulative impacts to area cultural resources. The Knik Arm Crossing project would construct a bridge connecting Anchorage and the Matanuska-Susitna Borough. As the project is proposed to involve extensive construction, it has the potential to impact cultural resources, should they exist within the ROI. Additionally, two of the three bridge access routes would traverse Elmendorf AFB, potentially impacting the viewshed and traffic use patterns within the NRHP-eligible historic districts or other NRHP-eligible properties. The state of Alaska is also pursuing the construction of a natural gas pipeline that could include construction in the Anchorage area that would also have the potential to impact cultural resources, contributing to area cumulative impacts.

All of these projects would be subject to compliance with NEPA and Section 106 of the NHPA with the result that adverse effects would be mitigated, reducing potential for cumulative impacts.

Land Use and Transportation

Key elements of the Proposed Action, including flight activity, personnel changes, and facility construction, are consistent with existing land use plans and would not be expected to substantially affect land use patterns or traffic circulation in the ROI. Implementation of certain foreseeable future actions however, is likely to generate land use and transportation effects in the vicinity of Elmendorf AFB. The Knik Arm Crossing Project is proposed to alter circulation by linking the Municipality of Anchorage and the Matanuska-Susitna Borough, potentially affecting development patterns in the region. In addition, two of the three proposed bridge access routes would traverse Elmendorf AFB. Proposed expansion at the Port of Anchorage, just west of Elmendorf AFB, could alter land use and land ownership patterns, and increase traffic congestion. Construction of these and other reasonably foreseeable projects, depending on potential concurrent scheduling with the Proposed Action, could increase pressure on regional infrastructure and construction resources. However, incremental effects of the Proposed Action, which are minor, would not be expected to create significant or adverse cumulative effects to land use resources in the region.

Socioeconomics

Proposed personnel changes and facility construction and modification associated with the Proposed Action are not expected to generate significant adverse impacts to populations or economic activity in the ROI. Economic pursuits in the region are not expected to experience any major limitations or negative effects under implementation of the Proposed Action separately or in conjunction with relevant past, present, and reasonably foreseeable future actions. A number of both military and non-military projects would increase the demand for construction employment and activity in the region. Although the increase in economic activity associated with a specific project would be temporary, lasting only for the duration of the construction period, the cumulative effects of the construction projects create employment for the foreseeable future. Incremental effects of the 176 WG beddown, in combination with potential impacts associated with the reasonably foreseeable future actions, would not be expected to create any significant or adverse cumulative effect to socioeconomic resources in the region.

Environmental Justice

Proposed personnel changes and facility construction and modification associated with the Proposed Action are not expected to generate significant adverse impacts, separately or cumulatively, on minority, low-income, or youth populations in the ROI. The incremental effects of this proposal, in combination with potential impacts associated with the relevant past, present, and reasonably foreseeable future actions would also not be expected to have any cumulative environmental justice effects.

5.2 Other Environmental Considerations

5.2.1 Relationship Between Short-Term Uses and Long-Term Productivity

CEQ regulations (Section 1502.16) specify that environmental analysis must address "…the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity." Special attention should be given to impacts that narrow the range of beneficial uses of the environment in the long-term or pose a long-term risk to human health or safety. This section evaluates the short-term benefits of the proposal compared to the long-term productivity derived from not pursuing the proposal.

Short-term effects to the environment are generally defined as a direct consequence of a project in its immediate vicinity. Short-term effects could include localized disruptions and higher noise levels in some areas. Noise levels would change very little from current conditions. The military training that occurs in the airspace results in noise effects that are transitory in nature. Noise effects would be short term and would not be expected to result in permanent or long-term changes in wildlife or habitat use. Under the 176 WG Proposed Action, these short-term uses would have a negligible cumulative effect.

The 176 WG proposal largely involves changes in building structures and would not significantly impact the long-term productivity of the land.

5.2.2 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action.

For Elmendorf AFB, most impacts are short-term and temporary (such as air emissions from construction) or longer lasting, but negligible (such as noise). Construction would use materials (e.g., metal, wood, concrete) and energy (fuel, electricity) that would be irretrievably lost. Air Force and personal vehicle use would consume fuel, oil, and lubricants.

Training operations would involve consumption of nonrenewable resources, such as gasoline used in vehicles, and jet fuel used in aircraft. None of these activities would be expected to significantly decrease the availability of minerals or petroleum resources or have cumulative environmental consequences.

6.0 REFERENCES

3rd Wing (3 WG). 2004. Wing Instruction 13-203. Airfield and Air Traffic Control Procedures. 1 March.

Air Force Safety Center. 2002. Bird-Aircraft Strike Hazard Team. Selected Statistics. http://safety/Kirtland.af.mil/AFSC/Bash/stats/web_pof_stat.html

_____. 2004. Class A Mishaps and Wildlife Strikes http://safety.kirtland.af.mil/AFSC/BASH/stats

Alaska Department of Fish and Game. 2005a. State of Alaska Endangered Species List. Website accessed on December 22, 2005. http://www.wc.adfg.state.ak.us/index.cfm?adfg=endangered.list

_____ . 2005b. State of Alaska Species of Special Concern. Website accessed on December 22, 2005. http://www.wc.adfg.state.ak.us/index.cfm?adfg=endangered.concern

Alaska Department of Labor. 1998. Alaska Population Projections 1998-2018. Alaska Department of Labor, Research & Analysis Section. 1998.

American National Standards Institute. 1980. Sound Level Descriptors for Determination of Compatible Land Use. American National Standards Institute Standard ANSI S3.23-1980.

_____ . 1988. Quantities and Procedures for Description and Measurement of Environmental Sound, Part 1. American National Standards Institute Standard ANSI S12.9-1988.

Bailey, R.G. 1995. Descriptions of the Ecoregions of the United States. Second Edition. U.S. Forest Service Miscellaneous Publication Number 1391.

Coastal America. 1992. Coastal America Memorandum of Understanding, Statement of Principles for a Coastal America Partnership for Action to Protect, Restore and Maintain the Nation's Coastal Living Resources. Available at http://www.coastalamerica.gov/text/military.pdf

Council on Environmental Quality (CEQ). 1997. Considering Cumulative Effects Under the National Environmental Policy Act. January 1997.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. The Birder's Handbook: A Field Guide to the Natural History of North American Birds. Simon and Schuster, New York, New York.

Elmendorf Air Force Base (AFB). 2003. Wing Instruction 91-212. Bird and Wildlife Aircraft Strike Hazard (BASH) Program. 30 September.

_____ . 2006a. Air Field Criteria Violation Report. October.

_____ . 2006b. Elmendorf AFB Geobase Data.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Waterways Experiment Station Technical Report Y-87-1, Vicksburg, Mississippi.

Federal Interagency Committee on Noise. 1992. Federal Agency Review of Selected Airport Noise Analysis Issues. Federal Interagency Committee on Noise. August.

Federal Interagency Committee on Urban Noise. 1980. Guidelines for Considering Noise in Land-Use Planning and Control. Federal Interagency Committee on Urban Noise. June.

Federation of American Scientists. 1998. C-130 Broad Area Review. January.

Jagielski, K. and J. O'Brien. 1994. Calculations Methods for Criteria Air Pollution Emission Inventories. USAF, Armstrong Laboratory, AL/OE-TR-1994-0049. Brooks Air Force Base, Texas.

National Oceanic and Atmospheric Administration National Marine Fisheries Service. 2003. Subsistence Harvest Management of Cook Inlet Beluga Whales. Final Environmental Impact Statement. July.

National Register Information System (NRIS). 2007. Query of NRIS database of National Register listed properties for Alaska. Website accessed in May 2007. http://www.nr.nps.gov/

Nullmeyer, Dr. Bob, Maj. David Stella, John Flournoy, and Lt Col Don White. n.d. Using Air Force Aviation Mishap Data to Improve C-130 CRM Training.

O'Brien, R.J. and M.D. Wade. 2002. Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations. Air Force Institute for Environment, Safety, and Occupational Health Risk Analysis. IERA-RS-BR-SR-2001-0010. Brooks Air Force Base, Texas. January.

South Coast Air Quality Management District. 1993. CEQA Air Quality Handbook.

United States Air Force (Air Force). 1994. Air Force Instruction (AFI) 32-7064. Integrated Natural Resources Management. 22 July.

_____ . 2001a. Air Force Instruction (AFI) 13-201. Space, Missile, Command and Control. Air Force Airspace Management. 20 September.

_____ . 2001b. Initial F-22 Operational Wing Beddown Final EIS. November.

_____ . 2003a. Five-Year Review. Second Five-Year Review Report. United States Air Force Elmendorf Air Force Base. November.

_____ . 2003b. Integrated Cultural Resources Management Plan, Elmendorf Air Force Base, Alaska. Contracted by Air Force Center for Environmental Excellence, Brooks Air Force Base, Texas.

_____ . 2004a. C-17 Beddown EA, Elmendorf AFB, Alaska. September 2004.

_____ . 2004b. Air Force Instruction (AFI) 91-204. Safety Investigations and Reports; HQ AFSC/STEP. 12 April.

_____ . 2005a. Base Realignment and Closure 2005. Air Force Link. Official Website of the U.S. Air Force. http://www.af.mil/brac/alaska.asp#Anchor-Kulis-38219

_____ . 2005b. Criteria Air Pollutant Potential Emissions Inventory Final Report. June.

_____ . 2005c. Storm Water Pollution Prevention Plan, United States Air Force, Elmendorf Air Force Base, Alaska. September.

_____ . 2005d. FY05 Elmendorf AFB Economic Impact Analysis (EIA).

_____ . 2006a. F-22 Beddown Environmental Assessment. Elmendorf AFB, Alaska. June.

_____ . 2006b. Integrated Natural Resources Management Plan for Elmendorf Air Force Base 2000–2005: 3rd Wing U.S. Air Force. June 2000. CEMML TPS 00-10.

_____ . 2006c. General Plan, Elmendorf AFB. November.

_____ . 2007. Final Environmental Restoration Program Atlas.

United States Army Corps of Engineers (USACE). 2001. Unified Facilities Criteria 3-260-01, Airfield and Heliport Planning and Design Criteria. November.

United States Bureau of the Census. 2000. American FactFinder. Census 2000 Summary File 1, demographic and economic data sets for Alaska state, boroughs, and municipalities. Website accessed December 28, 2005. http://factfinder.census.gov

_____ . 2005. State & County QuickFacts from the U.S. Census Bureau. Census data for Alaska state, boroughs, and municipalities. Website accessed December 26, 2005. http://quickfacts.census.gov

United States Bureau of Economic Analysis. 2005. Regional Economic Information System. Table CA25N Total full-time and part-time employment by industry for Alaska State and Anchorage Municipality. April 2005.

United States Coast Guard. 2006. Press Release: Cougar Ace summary of events. U.S. Department of Homeland Security, 17th District Office of Public Affairs, U.S. Coast Guard. 26 July.

United States Environmental Protection Agency (USEPA). 1974. Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety. U.S. Environmental Protection Agency Report 550/9-74-004. March.

_____ . 2005a. 8-Hr Ozone and Designated PM-2.5 Nonattainment Areas. United States Environmental Protection Agency, Green Book. Website updated October 14, 2005. http://www.epa.gov/oar/oaqps/greenbk/qncl3.html

_____ . 2005b. 1999 National Emission Inventory. Website last updated in 1999. http://www.epa.gov/ttn/chief/net/1999inventory.html

United States Fish and Wildlife Service (USFWS). 2005. Threatened and Endangered Species System (TESS). Listings by state and territory as of 12/21/2005 – Alaska. Website accessed on December 21, 2005. http://ecos.fws.gov/tess_public/servlet/gov.doi.tess_public.servlets.UsaLists?state=AK

Wasmer, F. and F. Maunsell 2005. NMPlot Computer Program. Wasmer Consulting.

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Griese, Herman. 2007. Biological Resources Manager, 3 CES/CEVP, Elmendorf AFB, Alaska.

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M.B.A, University of Texas at San Antonio, 2000
Years of Experience: 16

Robert E. Van Tassel, Program Manager
B.A., Economics, University of California, Santa Barbara, 1970
M.A., Economics, University of California, Santa Barbara, 1972
Years of Experience: 34

Kimberly Wilson, Production Manager
Years of Experience: 20

William Wuest, Noise
B.S., Political Science, St. Joseph's College, 1963
M.P.A., Public Administration, Auburn University, 1974
Years of Experience: 39

APPENDIX A
BASE REALIGNMENT AND CLOSURE 2005 AND NATIONAL ENVIRONMENTAL POLICY ACT CONSIDERATIONS

APPENDIX A BASE REALIGNMENT AND CLOSURE 2005 AND NATIONAL ENVIRONMENTAL POLICY ACT CONSIDERATIONS

Excerpts from the Department of Defense Report to the Defense Base Closure and Realignment Commission, Department of the Air Force Analysis and Recommendations, Base Realignment and Closure (BRAC) 2005.

BRAC CONSIDERATIONS - ALASKA

Kulis Air Guard Station, AK - Close Kulis Air Guard Station no later than 15 Sep 2011. This action is contingent on the availability of adequate military construction funds to provide the necessary facilities at Elmendorf AFB, AK. The Air National Guard is responsible for this closure through the following actions:

1. Relocate the 176th Wing (ANG) and associated aircraft (eight C-130Hs, three HC-130Ns, and five HH-60s) and ECS to Elmendorf AFB, AK no later than 15 Sep 2011.

2. Establish an active association (ANG/active duty) with 12 C-130 aircraft at Elmendorf AFB no later than 15 Sep 2011. The 4 additional C-130 aircraft required beyond the 8 relocated to the 176th Wing C-130s are to be sourced by the Air Reserve Component (ARC). The Air National Guard is responsible for effecting this movement. PACAF is responsible for sourcing and movement of the Active Duty manpower needed to form the association.

Elmendorf Air Force Base, AK - Pacific Air Forces is responsible for Elmendorf AFB, AK. Realign Elmendorf through the following actions:

1. Receive the 176th Wing (ANG) and associated aircraft (eight C-130Hs, three HC-130Ns, and five HH-60s) and Expeditionary Combat Support (ECS) from Kulis AGS no later than 15 Sep 2011. This action is contingent on the availability of adequate military construction funds to provide the necessary facilities at Elmendorf AFB. The ANG is responsible for the Kulis movement.

2. Establish an active association (ANG/active duty) in the 176th Wing at Elmendorf AFB, with 12 C-130H aircraft, no later than 15 Sep 2011. The 4 additional C-130 aircraft required beyond the 8 relocated to the 176th Wing C-130s are to be sourced by the Air Reserve Component (ARC). The Air National Guard is responsible for effecting this movement. PACAF is responsible for sourcing and movement of the Active Duty manpower needed to form the association.

3. Distribute 18 F-15E aircraft from the 3rd Wing, Elmendorf AFB, to the 366th Fighter Wing, Mountain Home AFB, ID, no later than 30 Sep 2007. PACAF is responsible for effecting this movement.

4. Distribute 18 of 42 assigned F-15C/D from the 3d Wing at Elmendorf Air Force Base to the 1st Fighter Wing, Langley Air Force Base, VA, no later than 30 Sep 2007. PACAF is responsible for effecting this movement.

5. Relocate installation management functions from Fort Richardson, AK, to Elmendorf AFB, AK, and establish Joint Base Elmendorf-Richardson, AK (see Appendix 1) no later than 30 Sep 2009. The Army is responsible for effecting this movement and coordinating with PACAF.

6. Distribute 6 of 42 assigned F-15C/D from the 3d Wing at Elmendorf Air Force Base to an Air National Guard unit, no later than 15 Sep 2011. PACAF is responsible for effecting this movement.

Eielson Air Force Base, AK – Pacific Air Forces is responsible for Eielson AFB, AK. Realign Eielson through the following actions:

1. Distribute the 354th Fighter Wing's assigned A-10 aircraft to meet PAA requirements established by the Base Closure and Realignment recommendations of the Secretary of Defense, as amended by the Defense Base Closure and Realignment Commission:

   (a) Increase the 917th Wing Barksdale AFB, LA (3 PAA A-10 aircraft) not later than 30 Sep 2007.

   (b) Establish 48 PAA a-10 aircraft at Moody AFB, GA, not later than 30 Sep 2009.

   (c) Distribute Eielson's remaining assigned A-10 aircraft to backup inventory (3 PAA aircraft) not later than 30 Sep 2007.

   (d) PACAF is responsible for these moves.

2. The Air National Guard Tanker unit and rescue alert detachment will remain as tenants on Eielson.

3. Eielson will receive the alert mission responsibility from closure of Galena Forward Operating Location, AK no later than 30 Sep 2008.

Galena Forward Operating Location (FOL), AK – Close Galena FOL, AK, NLT 30 Sep 2008 and transfer alert mission to Eielson AFB. PACAF is responsible for Galena FOL closure.

ENVIRONMENTAL CONSIDERATIONS

Environmental Impacts. The provisions of the National Environmental Policy Act of 1969 (NEPA, 42 D.S.C. 4321 et seq.) will apply to AF actions with respect to installations selected for closure and realignment by the Commission. NEPA requires that an environmental impact statement (EIS) be prepared prior to proceeding on major federal actions significantly affecting the quality of the human environment. The Defense Base Closure and Realignment Act of 1990 exempts the actual decision to close bases from the NEPA process, as well as the selection of installations for realignment (except where multiple realignment installations have been named for discretionary implementation). However, the impact of the unit relocations and property

disposal must be evaluated under NEPA. The environmental impact analysis process will evaluate alternative locations on a given base (as compared with different bases) as well as socio-economic, cultural, land, water, air, endangered species, critical habitat and cultural and historic resource issues. Procedures are set forth in AFI 32-7061 and 32 CFR Pt 989.

Review of Unique Environmental Matters. Pending issues unique to closing or realigning installations will need to be reviewed for any needed base support. Examples include, but are not limited to: water rights and Endangered Species Act issues; preservation of historical facilities; AICUZ and any environmental claims and/or litigation.

Environmental Impact Analysis Process (EIAP). Scheduled so as not to hinder or delay closure/realignment.

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APPENDIX B
PROJECTS ASSOCIATED WITH ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

APPENDIX B PROJECTS ASSOCIATED WITH ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

Table B-1. Helicopters on South Side of East-West Runway

Project Name	*Building Square Feet*
Fiscal Year 2007 Projects	
Aircraft Park Apron – Phase I	
Construct Infrastructure and Utilities for C-130 Aircraft	
Engine Storage Facility (for C-17 to replace C-130 use of Hangar 18)	10,000
Fiscal Year 2008 Projects	
Aircraft Maintenance Complex	47,300
Pararescue Operations Complex	43,200
Maintenance Group and LRS Forward Supply (Building 10571/Hangar 3 - Renovations)	32,091
Maintenance Group Helicopter Maintenance (Building 10571/Hangar 3 - Renovations)	32,831
Fiscal Year 2009 Projects	
Security Forces Squadron/Combat Arms Training Maintenance (CATM) (Building 4309 – New Construction)	2,400
Civil Engineer Squadron (Building 5312 - Renovations)	15,085
LRS/Vehicle Maintenance Flight (Building 6211 - Renovations)	16,040
Security Forces Complex (Building 7252-Renovations)	11,500
Communications Flight (Building 10471 – Renovations)	10,600
LRS/Fuels Management Flight (Building 11673 – Renovations)	1,785
Aerial Port Flight (Building 15380 – New Construction)	5,900
Aircraft Support Equipment (Building 15431 – New Construction)	7,000
Logistics Readiness Squadron (LRS)/Base Supply (Building 4251 - Renovations)	17,500
Combat Readiness and Resources Flight and Wing Plans (Building 15510 – Renovations)	975
Operations Group (Building 17470 or Hangar 18 – New Construction)	15,759
Operations Group and Maintenance Alter (Building 17470/Hangar 18 - Renovations)	43,691
Medical Group – New Construction	10,000
Operations and Training – New Construction	18,700
LRS Administrative – New Construction	7,100
Training Fire Station – New Construction	3,700
Corrosion Control/Fuel Cell Hangar – Building 15455/Hangar 10	44,400
Fiscal Year 2010 Projects	
C-130 Aircraft Parking Apron – Phase II	
Force Integration Areas (Facilities Shared by Air Force and Air National Guard)	
Public Affairs (Building 10480 – Rooms 119 and 121)	
Command Post	
Equal Employment Opportunity	
Traffic Management Office	
Services Squadron	

Table B-2. Helicopters at Fort Richardson

Project Name	*Building Square Feet*
Fiscal Year 2007 Projects	
C-130 Aircraft Parking Apron – Phase I	
Construct Infrastructure and Utilities for C-130 aircraft	
Engine Storage Facility (for C-17 to replace C-130 use of Hangar 18)	10,000
Fiscal Year 2008 Projects	
Aircraft Maintenance Complex	47,300
Pararescue Operations Complex	43,200
Maintenance Group and LRS Forward Supply – New Construction	32,091
Maintenance Group Helicopter Maintenance – New Construction	32,831
Fiscal Year 2009 Projects	
Security Forces Squadron (SFS)/Combat Arms Training Maintenance (CATM) (Building 4309 – New Construction)	2,400
Civil Engineer Squadron (Building 5312 - Renovations)	15,085
LRS/Vehicle Maintenance Flight (Building 6211 - Renovations)	16,040
Security Forces Squadron (Building 7252-Renovations)	11,500
Communications Squadron (Building 10471 – Renovations)	10,600
LRS/Fuels Management Flight (Building 11673 – Renovations)	1,785
Aerial Port Flight (Building 15380 – New Construction)	5,900
Aircraft Support Equipment (Building 15431 – New Construction)	7,000
Logistics Readiness Squadron (LRS)/Base Supply (Building 4251 - Renovations)	17,500
Combat Readiness and Resources Flight and Wing Plans (Building 15510 – Renovations)	975
Operations Group (Building 17470/Hangar 18 – New Construction)	15,759
Operations Group and Maintenance Alter (Building 17470/Hangar 18 - Renovations)	43,691
Medical Group – New Construction	10,000
Wing Operations and Training – New Construction	18,700
Supply – New Construction	7,100
Training Fire Station – New Construction	3,700
Corrosion Control/Fuel Cell Hangar (Building 15455/Hangar 10 – Renovation)	44,400
Fiscal Year 2010 Projects	
C-130 Aircraft Parking Apron – Phase II	
Force Integration Areas (Facilities Shared by Air Force and Air National Guard)	
Public Affairs (Building 10480 – Rooms 119 and 121)	
Command Post	
Equal Employment Opportunity	
Traffic Management Office	
Services Squadron	

APPENDIX C
AGENCY COORDINATION

DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

15 May 2007

MEMORANDUM FOR DISTRIBUTION

FROM: 3 CES/CC
6326 Arctic Warrior Drive
Elmendorf AFB AK 99506-3240

SUBJECT: Beddown of the Alaska Air National Guard (ANG) 176th Wing on Elmendorf Air Force Base (AFB), Alaska Draft Environmental Assessment (EA)

1. The United States Air Force (Air Force) is preparing a Draft EA to determine the potential environmental consequences of the placement of the Alaska ANG's 176th Wing and all associated aircraft including, twelve C-130Hs, four HC-130Ns, and six HH-60 helicopters and Expeditionary Combat Support on Elmendorf AFB. The 176th Wing is currently based at Kulis Air Guard Station (AGS), but must be relocated as the result of the closure of Kulis AGS under Base Realignment and Closure 2005 recommendations. The beddown, or location, of the 176th Wing to Elmendorf AFB will maintain its presence in Alaska and create an active association between ANG and active duty Air Force at Elmendorf AFB. Mission-related training and operations of the 176th Wing will remain the same as current. As part of the Proposed Action, some new facilities, renovation of existing facilities, and replacement of support equipment will be required. A No Action Alternative is also being analyzed.

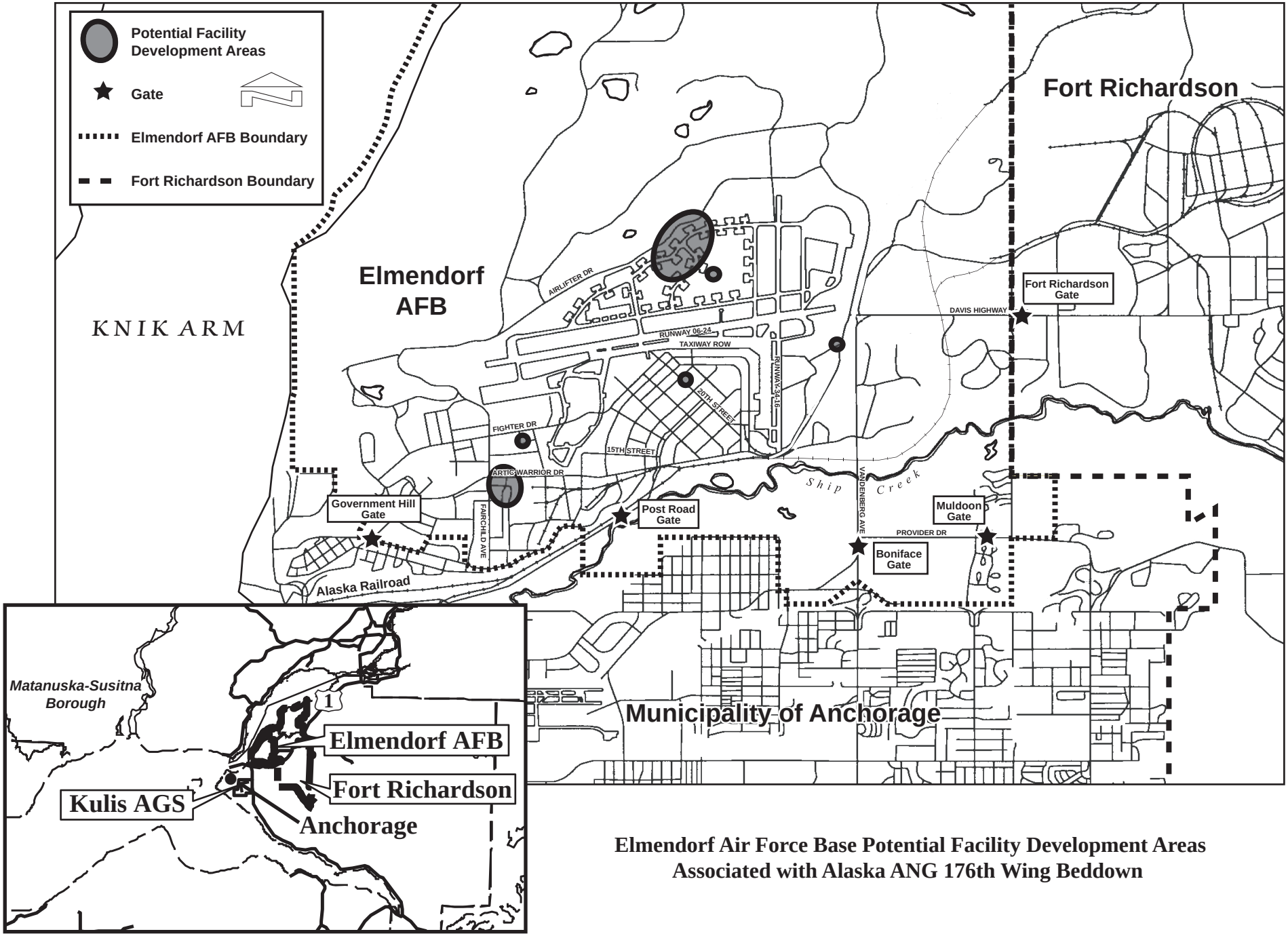
2. A display advertisement announcing the Air Force's intention to prepare the Draft EA was published in the Anchorage Daily News and Sourdough Sentinel on 11 May 2007.

3. As part of this National Environmental Policy Act process, the Air Force is seeking comments or input regarding their proposal. In order to give your comments or concerns full consideration early in the development of the Draft EA, we would appreciate receiving your response by 15 June 2007.

4. If you have any specific questions about the proposal, we would like to hear from you. Please feel free to contact the Environmental Project Manager, Ms. Ellen Godden, at the above address. Ms. Godden can be reached at (907) 552-7305. Thank you for your assistance in this matter.

JAMES C. HODGES, Lt Col, USAF
Commander

Attachments:
1. Elmendorf AFB Map
2. Distribution List



Elmendorf Air Force Base Potential Facility Development Areas Associated with Alaska ANG 176th Wing Beddown

IICEP Distribution List

FIRST NAME	*SURNAME*	*COMPANY*	*ADDRESS1*	*ADDRESS2*	*ADDRESS3*	*CITY*	*ST*	*ZIP*
Julie	Kitka	Alaska Federation of Natives	1577 C Street	Suite 300		Anchorage	AK	99501-5113
Carol	Burnell	Native Village of Tyonek (IRA)	P.O. Box 82009			Tyonek	AK	99682-0009
Michael	Tucker	Knik Tribal Council	P.O. Box 871565			Wasilla	AK	99687-1565
Dorothy	Cook	Native Village of Eklutna	26339 Eklutna Village			Chugiak	AK	99567-5148
Marcia	Combes	U.S. Environmental Protection Agency	222 W. 7th Ave., #19			Anchorage	AK	99513-7588
Stephen	Boardman	U.S. Army Corp of Engineers	Project Management Division	P.O. Box 6898		Elmendorf AFB	AK	99506
		U.S. Department of Interior	Office of Environmental Policy	1689 C Street, Rm. 119		Anchorage	AK	99501
		National Park Service, Alaska Regional Office	ATTN: Regional Director	240 W. 5th Ave., Rm. 114		Anchorage	AK	99501
Kevin	Gardner	U.S. Army Alaska	730 Quartermaster Rd.			Fort Richardson	AK	99505
		United States Coast Guard	Marine Safety Office	510 L St., Ste. 100		Anchorage	AK	99501-1946
Patrick	Poe	U.S. Department of Transportation	Federal Aviation Administration	222 W. 7th Ave.		Anchorage	AK	99513
		U.S. Department of Transportation	Federal Highway Administration, Alaska Division	P.O. Box 21648	709 W. 9th St., Rm. 851	Juneau	AK	99802-1648
		U.S. Department of Transportation	Region 10 Federal Transit Administration	915 Second Ave., Ste. 3142		Seattle	WA	98174-1002
Michael	Carter	U.S. Department of Transportation	Maritime Administration	400 7th St. SW, Rm. 7310	MAR-800	Washington	DC	20590
		U.S. Department of Transportation	Federal Transit Administration - Region 10	Jackson Federal Building	915 Second Ave., Ste. 3142	Seattle	WA	98174-1002
		U.S. Department of Interior	Bureau of Indian Affairs, Alaska Regional Office	ATTN: Regional Director	3601 C St.	Anchorage	AK	99503-5952
Mark	Fullmer	Bureau of Land Management	Anchorage Field Office	6881 Abbott Loop Rd.		Anchorage	AK	99507-2599
Brian	Lance	National Marine Fisheries Service	222 W. 7th Ave., Rm. 517			Anchorage	AK	99513
		U.S. Department of Agriculture	NRCS	510 L Street		Anchorage	AK	99501-1935

FIRST NAME	SURNAME	COMPANY	ADDRESS1	ADDRESS2	ADDRESS3	CITY	ST	ZIP
		U.S. Department of Commerce	NOAA, NMFS, Alaska Region - Anchorage Office	ATTN: Protected Resources and Habitat Conservation Divisions	222 W. 7th Ave., Box 43	Anchorage	AK	99513-7577
Sue	Magee	State of Alaska	Division of Governmental Coordination	550 W. 7th Ave., Ste. 1660		Anchorage	AK	99501
Craig	Campbell	State of Alaska	Department of Military and Veteran Affairs	P.O. Box 5800 Camp Denali		Ft. Richardson	AK	99505-5800
Michael	Menge	State of Alaska	Department of Natural Resources	550 W. 7th St., Ste. 500		Anchorage	AK	99501-3561
Dave	Eberle	State of Alaska	Department of Transportation	Central Region Office	4111 Aviation Ave.	Anchorage	AK	99519
William	Sheffield	Port of Anchorage	2000 Anchorage Port Rd.			Anchorage	AK	99501
		Municipality of Anchorage	Department of Community Planning and Development	P.O. Box 196650		Anchorage	AK	99519
Carol	Comeau	Anchorage School District	4600 DeBarr Rd.	P.O. Box 6614		Anchorage	AK	99508-6614
Marc	VanDongen	Matanuska-Susitna Borough	350 East Dahlia Ave			Palmer	AK	99645
Jim	Freechione	State of Alaska	Department of Environmental Conservation	555 Cordova St.		Anchorage	AK	99501
Grant	Hilderbrand	State of Alaska	Department of Fish and Game	Division of Wildlife Conservation	333 Raspberry Rd.	Anchorage	AK	99515
Bob	Roses	Northeast Community Council	8200 E. 2nd Ave.			Anchorage	AK	99504
Ken	Stout	Anchorage Assembly	P.O. Box 196650			Anchorage	AK	99519-6650
Stephanie	Kesler	Government Hill Community Council	P.O. Box 100018			Anchorage	AK	99510-0018
Hugh	Wade	Mountain View Community Council	733 N. Flower St.			Anchorage	AK	99508
Darrell	Hess	Fairview Community Council	328 E. 15th Ave., #1			Anchorage	AK	99501
		U.S. Fish and Wildlife Service	ATTN: Regional Wilderness Coordinator/NEPA Specialist	1011 E. Tudor, MS 221		Anchorage	AK	99503-6103

SARAH PALIN, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF PARKS AND OUTDOOR RECREATION

OFFICE OF HISTORY AND ARCHAEOLOGY

550 W. 7TH AVENUE, SUITE 1310
ANCHORAGE, ALASKA 99501-3565
PHONE: (907) 269-8721
FAX: (907) 269-8908

June 27, 2007

File No.: 3130-1R USAF Elmendorf

Gregory J. Schmidt
Chief, Environmental Planning and Conservation
Department of the Air Force
3 CES/CEVP
626 Arctic Warrior Drive
Elmendorf AFB, AK 99506-3240

Subject: Construction of facilities for Kulis relocation

Dear Mr. Schmidt:

This office received your letter on June 14, 2007 concerning the construction of four buildings associated with the Kulis Air National Guard relocation to Elmendorf. We reviewed this undertaking for potential effects to historic and cultural resources pursuant to Section 106 of the National Historic Preservation Act. The amount of new construction was examined to determine the impact of visual effects to the historic properties located on Elmendorf. We concur with your finding of No Historic Properties Adversely Affected.

Please contact Doug Gasek at 269-8726 if you have any questions or need further assistance.

Sincerely,

Joan M. Antonsson

Judith E. Bittner
Deputy State Historic Preservation Officer

JEB:dfg

cc: Susanne Fleek-Green, Anchorage Historic Preservation Commission

DRAFT EA DISTRIBUTION LIST

Draft EA Distribution List

FIRST NAME	SURNAME	ORGANIZATION	ADDRESS1	ADDRESS2	ADDRESS3	CITY	STATE	ZIP
		Alaska State Court Law Library	820 W. 4th Avenue			Anchorage	AK	99501
		Alaska State Library	P.O. Box 110571			Juneau	AK	99811
		Alaska Resources Library and Information Services	3211 Providence Dr.			Anchorage	AK	99508
		Wasilla Public Library	391 N. Main St.			Wasilla	AK	99654
		Elmendorf Library	3rd Services Squadron	10480 22nd Street		Elmendorf AFB	AK	99506
		ALCOM/J01	9480 Pease Ave., Ste. 136			Elmendorf AFB	AK	99506-2100
		U.S. Army Garrison	724 Postal Service Loop #6000			Ft. Richardson	AK	99505-6000
Louis	Howard	ADEC-SPAR CS Programs	DoD Oversight	555 Cordova St.		Anchorage	AK	99501-2617
Jacques	Gusmano	Environmental Protection Agency	Region X - Operations Office	222 W. 7th Ave., #19		Anchorage	AK	99513-7588
Julie	Kitka	Alaska Federation of Natives	1577 C Street	Suite 300		Anchorage	AK	99501-5113
Carol	Burnell	Native Village of Tyonek (IRA)	P.O. Box 82009			Tyonek	AK	99682-0009
Michael	Tucker	Knik Tribal Council	P.O. Box 871565			Wasilla	AK	99687-1565
Dorothy	Cook	Native Village of Eklutna	26339 Eklutna Village			Chugiak	AK	99567-5148
Marcia	Combes	U.S. Environmental Protection Agency	222 W. 7th Ave., #19			Anchorage	AK	99513-7588
Stephen	Boardman	U.S. Army Corp of Engineers	Project Management Division	P.O. Box 6898		Elmendorf AFB	AK	99506
		U.S. Department of Interior	Office of Environmental Policy	1689 C Street, Rm. 119		Anchorage	AK	99501
		National Park Service, Alaska Regional Office	ATTN: Regional Director	240 W. 5th Ave., Rm. 114		Anchorage	AK	99501
Kevin	Gardner	U.S. Army Alaska	730 Quartermaster Rd.			Fort Richardson	AK	99505
		United States Coast Guard	Marine Safety Office	510 L St., Ste. 100		Anchorage	AK	99501-1946
Patrick	Poe	U.S. Department of Transportation	Federal Aviation Administration	222 W. 7th Ave.		Anchorage	AK	99513
		U.S. Department of Interior	Bureau of Indian Affairs, Alaska Regional Office	ATTN: Regional Director	3601 C St.	Anchorage	AK	99503-5952
Mark	Fullmer	Bureau of Land Management	Anchorage Field Office	6881 Abbott Loop Rd.		Anchorage	AK	99507-2599

FIRST NAME	SURNAME	ORGANIZATION	ADDRESS1	ADDRESS2	ADDRESS3	CITY	STATE	ZIP
		National Marine Fisheries Service	222 W. 7th Ave., Stop 7			Anchorage	AK	99513
		U.S. Department of Agriculture	NRCS	510 L Street		Anchorage	AK	99501-1935
		U.S. Department of Commerce	NOAA, NMFS, Alaska Region - Anchorage Office	ATTN: Protected Resources and Habitat Conservation Divisions	222 W. 7th Ave., Box 43	Anchorage	AK	99513-7577
Sue	Magee	State of Alaska	Division of Governmental Coordination	550 W. 7th Ave., Ste. 1660		Anchorage	AK	99501
Craig	Campbell	State of Alaska	Department of Military and Veteran Affairs	P.O. Box 5800 Camp Denali		Ft. Richardson	AK	99505-5800
Michael	Menge	State of Alaska	Department of Natural Resources	550 W. 7th St., Ste. 500		Anchorage	AK	99501-3561
Gordon	Keith	State of Alaska	Department of Transportation	Central Region Office	4111 Aviation Ave.	Anchorage	AK	99519
The Honorable Lisa	Murkowski	US Senate	510 L St., Ste. 550			Anchorage	AK	99501
The Honorable Ted	Stevens	US Senate	222 W. 7th Avenue, #2			Anchorage	AK	99513
The Honorable Don	Young	U.S. House of Representatives	101 12th Avenue, #10			Fairbanks	AK	99701-6275
William	Sheffield	Port of Anchorage	2000 Anchorage Port Rd.			Anchorage	AK	99501
		Municipality of Anchorage	Department of Community Planning and Development	P.O. Box 196650		Anchorage	AK	99519
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Marc	VanDongen	Matanuska-Susitna Borough	350 East Dahlia Ave			Palmer	AK	99645
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Ken	Stout	Anchorage Assembly	P.O. Box 196650			Anchorage	AK	99519-6650
Stephanie	Kesler	Government Hill Community Council	P.O. Box 100018			Anchorage	AK	99510-0018
Hugh	Wade	Mountain View Community Council	733 N. Flower St.			Anchorage	AK	99508
Darrell	Hess	Fairview Community Council	328 E. 15th Ave., #1			Anchorage	AK	99501

FIRST NAME	SURNAME	ORGANIZATION	ADDRESS1	ADDRESS2	ADDRESS3	CITY	STATE	ZIP
		U.S. Fish and Wildlife Service	ATTN: Regional Wilderness Coordinator/NEPA Specialist	1011 E. Tudor, MS 221		Anchorage	AK	99503-6103
Ethan	Berkowitz	District 26	716 W. 4th Ave., Ste. 350			Anchorage	AK	99501-2133
Con	Bunde	District P	716 W. 4th Ave., Ste. 400			Anchorage	AK	99501-2133
Sharron	Cissna	District 22	716 W. 4th Ave., Ste. 360			Anchorage	AK	99501-2133
John	Cowdery	District O	716 W. 4th Ave., Ste. 500			Anchorage	AK	99501-2133
Harry	Crawford	District 21	716 W. 4th Ave., Ste. 540A, C			Anchorage	AK	99501-2133
Nancy	Dahlstrom	District 18	10928 Eagle River Rd., Ste. 238			Eagle River	AK	99577
Bettye	Davis	District K	716 W. 4th Ave., Ste. 450			Anchorage	AK	99501-2133
Fred	Dyson	District I	10928 Eagle River Rd., Ste. 238			Eagle River	AK	99577
Johnny	Ellis	District L	716 W. 4th Ave., Ste. 440			Anchorage	AK	99501-2133
Hollis	French	District M	716 W. 4th Ave., Ste. 420			Anchorage	AK	99501-2133
Les	Gara	District 23	716 W. 4th Ave., Ste. 540			Anchorage	AK	99501-2133
Carl	Gatto	District 13	600 E. Railroad Ave.			Wasilla	AK	99654
Lyda	Green	District G	600 E. Railroad Ave., Ste. 1			Wasilla	AK	99654
Max	Gruenberg	District 20	716 W. 4th Ave., Ste. 320			Anchorage	AK	99501-2133
John	Harris	District 12	716 W. 4th Ave., Ste. 300			Anchorage	AK	99501-2133
Mike	Hawker	District 32	716 W. 4th Ave., Ste. 620			Anchorage	AK	99501-2133
Berta	Gardner	District 24	716 W. 4th Ave., Ste. 340			Anchorage	AK	99501-2133
Vic	Kohring	District 14	600 E. Railroad Ave., Ste. 1			Wasilla	AK	99654
Bob	Lynn	District 31	716 W. 4th Ave., Ste. 650			Anchorage	AK	99501-2133
Mark	Neuman	District 15	600 E. Railroad Ave., Ste. 1			Wasilla	AK	99654

FIRST NAME	SURNAME	ORGANIZATION	ADDRESS1	ADDRESS2	ADDRESS3	CITY	STATE	ZIP
Lesil	Mcguire	District N	716 W. 4th Ave., Ste. 430			Anchorage	AK	99501-2133
Kevin	Meyer	District 30	716 W. 4th Ave., Ste. 310			Anchorage	AK	99501-2133
Charlie	Huggins	District H	600 E. Railroad Ave.			Wasilla	AK	99654
Donald	Olson	District T	716 W. 4th Ave., Ste. 560			Anchorage	AK	99501-2133
Ralph	Samuels	District 29	716 W. 4th Ave., Ste. 630			Anchorage	AK	99501-2133
Bill	Stoltze	District 16	600 E. Railroad Ave.			Wasilla	AK	99654
Dan	Sullivan	Anchorage Municipal Assembly	632 W. 6th Ave., Ste. 250			Anchorage	AK	99501
Allan	Tesche	Anchorage Municipal Assembly	1032 G St.			Anchorage	AK	99501
Gene	Therriault	District F	716 W. 4th Ave., Ste. 660			Anchorage	AK	99501-2133
Dick	Traini	Anchorage Municipal Assembly	2020 Dimond Dr.			Anchorage	AK	99507
		Military Sealift Command	7179 Fighter Drive			Elmendorf AFB	AK	99506-3575

APPENDIX D
AIRCRAFT NOISE ANALYSIS

APPENDIX D AIRCRAFT NOISE ANALYSIS

D.1 NOISE

Appendix D presents a detailed discussion of noise and its effects on people and the environment. An assessment of aircraft noise requires a general understanding of how sound is measured and how it affects people in the natural environment. The purpose of this appendix is to address public concerns regarding aircraft noise impacts.

Section D.1.1 is a general discussion on the properties of noise. Section D.1.2 summarizes the noise metrics discussed throughout this environmental assessment (EA). Section D.1.3 provides federal land-use compatibility guidelines that are used in analyzing aircraft noise impacts. Section D.2 addresses public concerns on potential impacts such as hearing loss, nonauditory health effects, annoyance, speech interference, sleep interference, and noise effects on domestic animals and wildlife.

D.1.1 Quantifying Sound

Noise, often defined as unwanted sound, is one of the most common environmental issues associated with aircraft operations. Of course, aircraft are not the only sources of noise in an urban or suburban surrounding, where interstate and local roadway traffic, rail, industrial, and neighborhood sources also intrude on the everyday quality of life. Nevertheless, aircraft are readily identifiable to those affected by their noise and are typically singled out for special attention and criticism. Consequently, aircraft noise problems often dominate analyses of environmental impacts.

Sound is a physical phenomenon consisting of minute vibrations which travel through a medium, such as air, and are sensed by the human ear. Whether that sound is interpreted as pleasant (for example, music) or unpleasant (for example, aircraft noise) depends largely on the listener's current activity, past experience, and attitude toward the source of that sound. It is often true that one person's music is another person's noise.

The measurement and human perception of sound involves two basic physical characteristics: intensity and frequency. Intensity is a measure of the acoustic energy of the sound vibrations and is expressed in terms of sound pressure. The higher the sound pressure, the more energy carried by the sound and the louder the perception of that sound. The second important physical characteristic is sound frequency which is the number of times per second the air vibrates or oscillates. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches.

The loudest sounds which can be detected comfortably by the human ear have intensities which are 1,000,000,000,000 times larger than those of sounds which can just be detected. Because of this vast range, any attempt to represent the intensity of sound using a linear scale becomes very unwieldy. As a result, a logarithmic unit known as the decibel (abbreviated dB) is used to represent the intensity of a sound. Such a representation is called a sound level.

A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above about 120 dB begin to be felt inside the human ear as discomfort and eventually pain at still higher levels.

Because of the logarithmic nature of the decibel unit, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. However, some simple rules of thumb are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example:

60 dB + 60 dB = 63 dB, and

80 dB + 80 dB = 83 dB.

The total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

60.0 dB + 70.0 dB = 70.4 dB.

Because the addition of sound levels behaves differently than that of ordinary numbers, such addition is often referred to as "decibel addition" or "energy addition." The latter term arises from the fact that what we are really doing when we add decibel values is first converting each decibel value to its corresponding acoustic energy, then adding the energies using the normal rules of addition, and finally converting the total energy back to its decibel equivalent.

An important facet of decibel addition arises later when the concept of time-average sound levels is introduced to explain Day-Night Average Sound Level. Because of the logarithmic units, the time-average sound level is dominated by the louder levels which occur during the averaging period. As a simple example, consider a sound level which is 100 dB and lasts for 30 seconds, followed by a sound level of 50 dB which also lasts for 30 seconds. The time-average sound level over the total 60-second period is 97 dB, not 75 dB.

The minimum change in the time-average sound level of individual events which an average human ear can detect is about 3 dB. A change in sound level of about 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness, and this relation holds true for loud sounds and for quieter sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound intensity but only a 50 percent decrease in perceived loudness because of the nonlinear response of the human ear (similar to most human senses).

Sound frequency is measured in terms of cycles per second (cps), or hertz (Hz), which is the preferred scientific unit for cps. The normal human ear can detect sounds which range in frequency from about 20 Hz to about 15,000 Hz. All sounds in this wide range of frequencies, however, are not heard equally well by the human ear, which is most sensitive to frequencies in the 1000 to 4000 Hz range. In measuring community noise, this frequency dependence is taken into account by adjusting the very high and very low frequencies to approximate the human ear's lower sensitivity to those frequencies. This is called "A-weighting" and is commonly used in measurements of community environmental noise.

Sound levels measured using A-weighting are most properly called A-weighted sound levels while sound levels measured without any frequency weighting are most properly called sound levels. However, since most environmental impact analysis documents deal only with A-weighted sound levels, the adjective "A-weighted" is often omitted, and A-weighted sound

levels are referred to simply as sound levels. In some instances, the author will indicate that the levels have been A-weighted by using the abbreviation dBA or dB(A), rather than the abbreviation dB, for decibel. As long as the use of A-weighting is understood to be used, there is no difference implied by the terms "sound level" and "A-weighted sound level" or by the units dB, dBA, and dB(A). In this document, all levels are A-weighted and are reported in dB, unless otherwise indicated.

Sound levels do not represent instantaneous measurements but rather averages over short periods of time. Two measurement time periods are most common — one second and one-eighth of a second. A measured sound level averaged over one second is called a slow response sound level; one averaged over one-eighth of a second is called a fast response sound level. Most environmental noise studies use slow response measurements, and the adjective "slow response" is usually omitted. It is easy to understand why the proper descriptor "slow response A-weighted sound level" is usually shortened to "sound level" in environmental impact analysis documents.

D.1.2 Noise Metrics

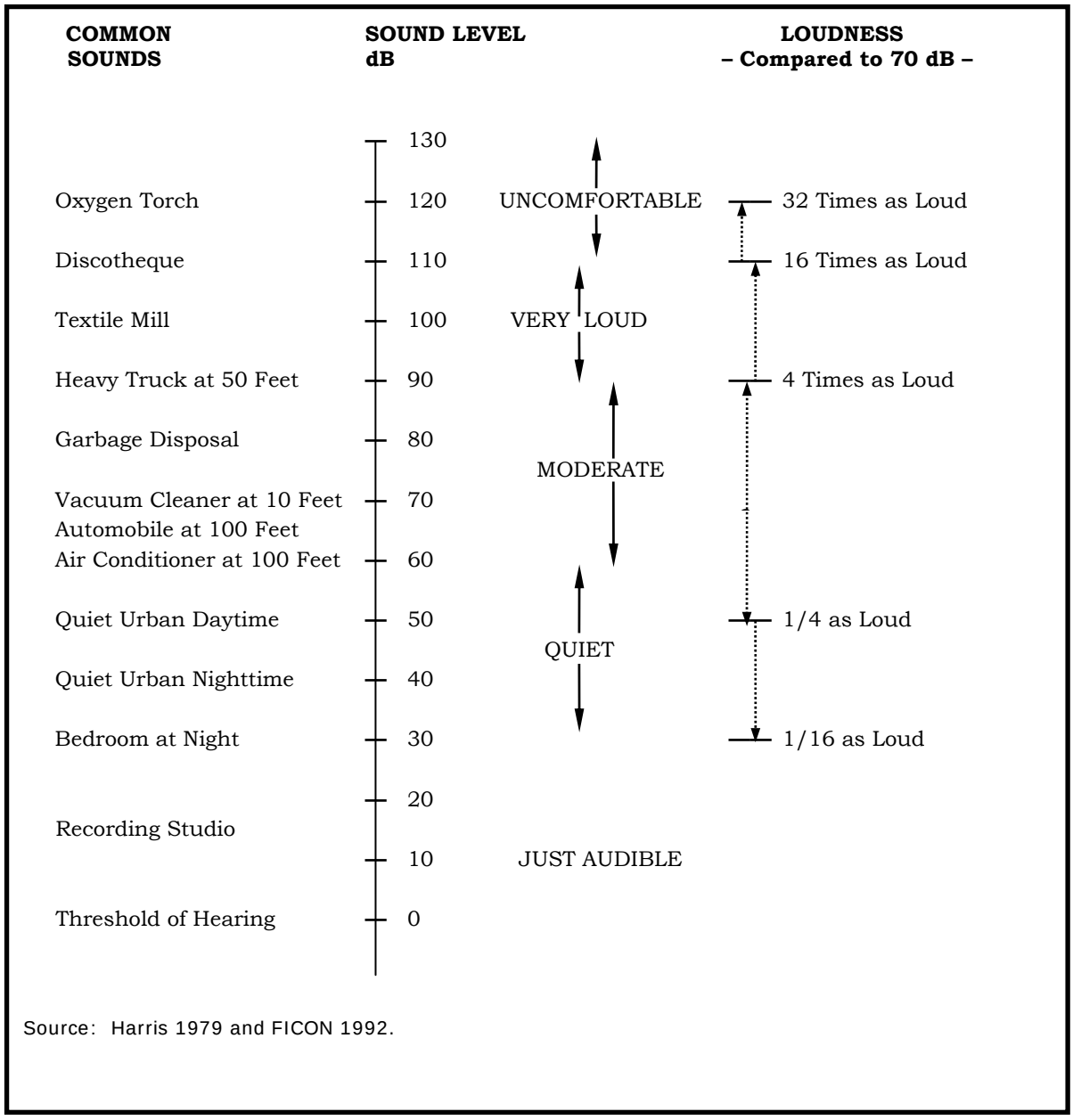
A "metric" is defined as something "of, involving, or used in measurement." As used in environmental noise analyses, a metric refers to the unit or quantity which quantitatively measures the effect of noise on the environment. Noise studies have typically involved a confusing proliferation of noise metrics as individual researchers have attempted to understand and represent the effects of noise. As a result, past literature describing environmental noise or environmental noise abatement has included many different metrics. Recently, however, various federal agencies involved in environmental noise mitigation have agreed on common metrics for environmental impact analysis documents, and both the Department of Defense (DoD) and the Federal Aviation Administration (FAA) have specified those which should be used for federal aviation noise assessments. These metrics are as follows.

D.1.2.1 Maximum Sound Level

The highest A-weighted sound level measured during a single event in which the sound level changes value as time goes on (e.g., an aircraft overflight) is called the maximum A-weighted sound level or maximum sound level, for short. It is usually abbreviated by ALM, L_{max}, or LA_{max} . The maximum sound levels of typical events are shown in Figure D-1. The maximum sound level is important in judging the interference caused by a noise event with conversation, TV or radio listening, sleep, or other common activities.

D.1.2.2 Sound Exposure Level

Individual time-varying noise events have two main characteristics — a sound level which changes throughout the event and a period of time during which the event is heard. Although the maximum sound level, described above, provides some measure of the intrusiveness of the event, it alone does not completely describe the total event. The period of time during which the sound is heard is also significant. The Sound Exposure Level (abbreviated SEL or LAE) combines both of these characteristics into a single metric.



Source: Harris 1979 and FICON 1992.

Figure D-1. Typical A-Weighted Sound Levels of Common Sounds.

Sound Exposure Level is a logarithmic measure of the total acoustic energy transmitted to the listener during the event. Mathematically, it represents the sound level of the constant sound that would, in one second, generate the same acoustic energy as did the actual time-varying noise event. Since aircraft overflights usually last longer than one second, the Sound Exposure Level of an overflight is usually greater than the maximum sound level of the overflight.

Sound exposure level is a composite metric which represents both the intensity of a sound and its duration. It does not directly represent the sound level heard at any given time, but rather provides a measure of the net impact of the entire acoustic event. It has been well established in the scientific community that Sound Exposure Level measures this impact much more reliably than just the maximum sound level.

Because the sound exposure level and the maximum sound level are both A-weighted sound levels expressed in decibels, there is sometimes confusion between the two, so the specific metric used should be clearly stated.

D.1.2.3 Day-Night Average Sound Level

Time-average sound levels are the measurements of sound levels which are averaged over a specified length of time. These levels provide a measure of the average sound energy during the measurement period.

For the evaluation of community noise effects, and particularly aircraft noise effects, the Day-Night Average Sound Level (abbreviated DNL or L_{dn}) is used. Day-Night Average Sound Level averages aircraft sound levels at a location over a complete 24-hour period, with a 10-decibel adjustment added to those noise events which take place between 10:00 p.m. and 7:00 a.m. (local time) the following morning. This 10-decibel "penalty" represents the added intrusiveness of sounds which occur during normal sleeping hours, both because of the increased sensitivity to noise during those hours and because ambient sound levels during nighttime are typically about 10 dB lower than during daytime hours.

Ignoring the 10-decibel nighttime adjustment for the moment, Day-Night Average Sound Level may be thought of as the continuous A-weighted Sound Level which would be present if all of the variations in sound level which occur over a 24-hour period were smoothed out so as to contain the same total sound energy.

Day-Night Average Sound Level provides a single measure of overall noise impact, but does not provide specific information on the number of noise events or the individual sound levels which occur during the day. For example, a Day-Night Average Sound Level of 65 dB could result from a very few noisy events, or a large number of quieter events.

As noted earlier for Sound Exposure Level, Day-Night Average Sound Level does not represent the sound level heard at any particular time, but rather represents the total sound exposure. Scientific studies and social surveys which have been conducted to appraise community annoyance to all types of environmental noise have found the Day-Night Average Sound Level to be the best measure of that annoyance. Its use is endorsed by the scientific community (ANSI 1980; ANSI 1988; USEPA 1972a; FICUN 1980; FICON 1992).

There is, in fact, a remarkable consistency in the results of attitudinal surveys about aircraft noise conducted in different countries to find the percentages of groups of people who express various degrees of annoyance when exposed to different levels of Day-Night Average Sound Level. This is illustrated in Figure D-2, which summarizes the results of a large number of social surveys relating community responses to various types of noises, measured in Day-Night Average Sound Level.

Figure D-2 was taken from a 1978 publication (Schultz 1978), and shows the original curve fit. A more recent study has reaffirmed this relationship (Fidell et al. 1991). Figure D-3 (FICON 1992) shows an updated form of the curve fit (Finegold et al. 1994) in comparison with the original. The updated fit, which does not differ substantially from the original, is the current preferred form. In general, correlation coefficients of 0.85 to 0.95 are found between the percentages of groups of people highly annoyed and the level of average noise exposure. The correlation coefficients for the annoyance of individuals are relatively low, however, on the order of 0.5 or less. This is not surprising, considering the varying personal factors which influence the manner in which individuals react to noise. Nevertheless, findings substantiate that community annoyance to aircraft noise is represented quite reliably using Day-Night Average Sound Level.

This relation between community annoyance and time-average sound level has been confirmed, even for infrequent aircraft noise events. A NASA study (Fields and Powell 1985) reported the reactions of individuals in a community to daily helicopter overflights, ranging from one to 32 per day. The stated reactions to infrequent helicopter overflights correlated quite well with the daily time-average sound levels over this range of numbers of daily noise events.

The use of Day-Night Average Sound Level has been criticized recently as not accurately representing community annoyance and land-use compatibility with aircraft noise. Much of that criticism stems from a lack of understanding of the basis for the measurement or calculation of L_{dn}. One frequent criticism is based on the inherent feeling that people react more to single noise events and not as much to "meaningless" time-average sound levels.

In fact, a time-average noise metric, such as L_{dn}, takes into account both the noise levels of all individual events which occur during a 24-hour period and the number of times those events occur. As described briefly above, the logarithmic nature of the decibel unit causes the noise levels of the loudest events to control the 24-hour average.

As a simple example of this characteristic, consider a case in which only one aircraft overflight occurs in daytime during a 24-hour period, creating a sound level of 100 dB for 30 seconds. During the remaining 23 hours, 59 minutes, and 30 seconds of the day, the ambient sound level is 50 dB. The Day-Night Average Sound Level for this 24-hour period is 65.5 dB. Assume, as a second example, that ten such 30-second overflights occur in daytime hours during the next 24-hour period, with the same ambient sound level of 50 dB during the remaining 23 hours and 55 minutes of the day. The Day-Night Average Sound Level for this 24-hour period is 75.4 dB. Clearly, the averaging of noise over a 24-hour period does not ignore the louder single events and tends to emphasize both the sound levels and number of those events. This is the basic concept of a time-average sound metric, and specifically the Day-Night Average Sound Level.

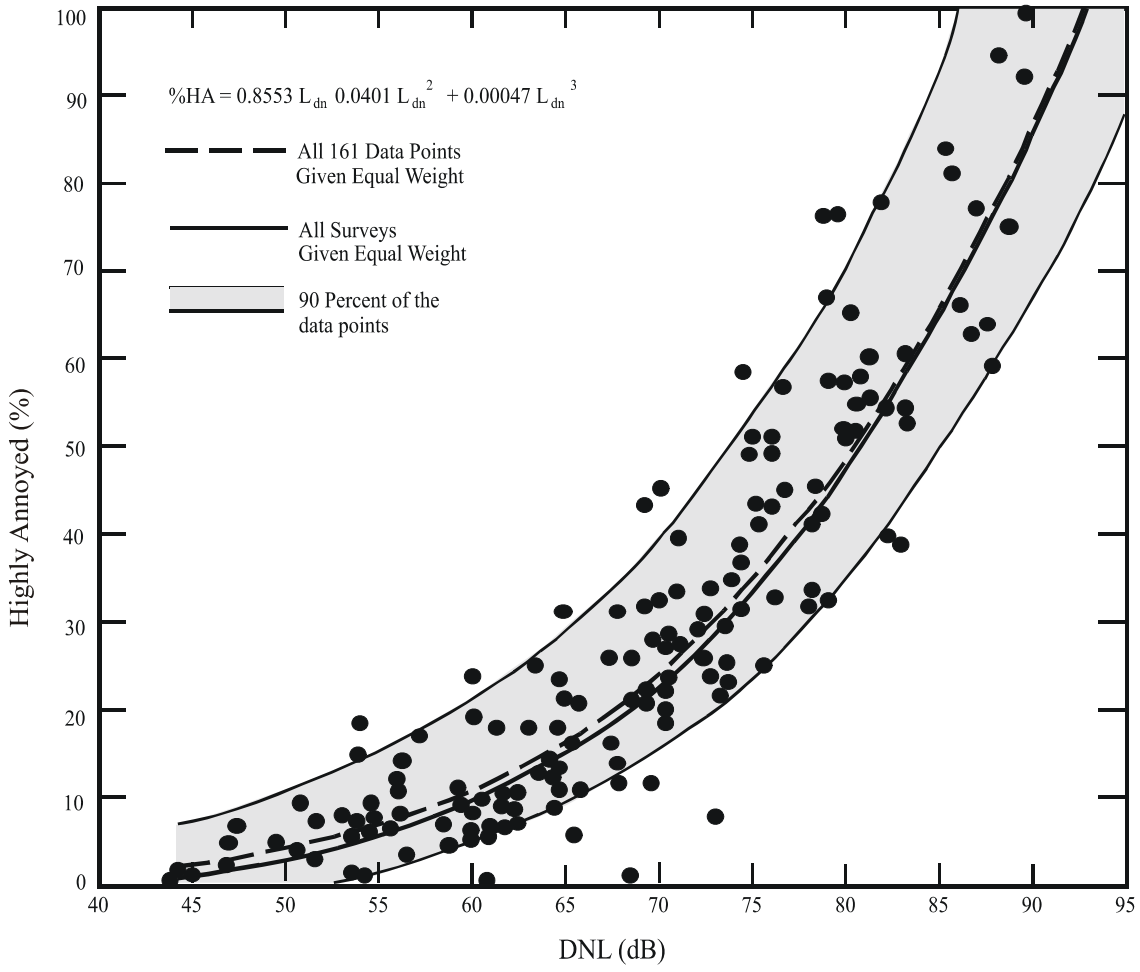


Figure D-2. Community Surveys of Noise Annoyance

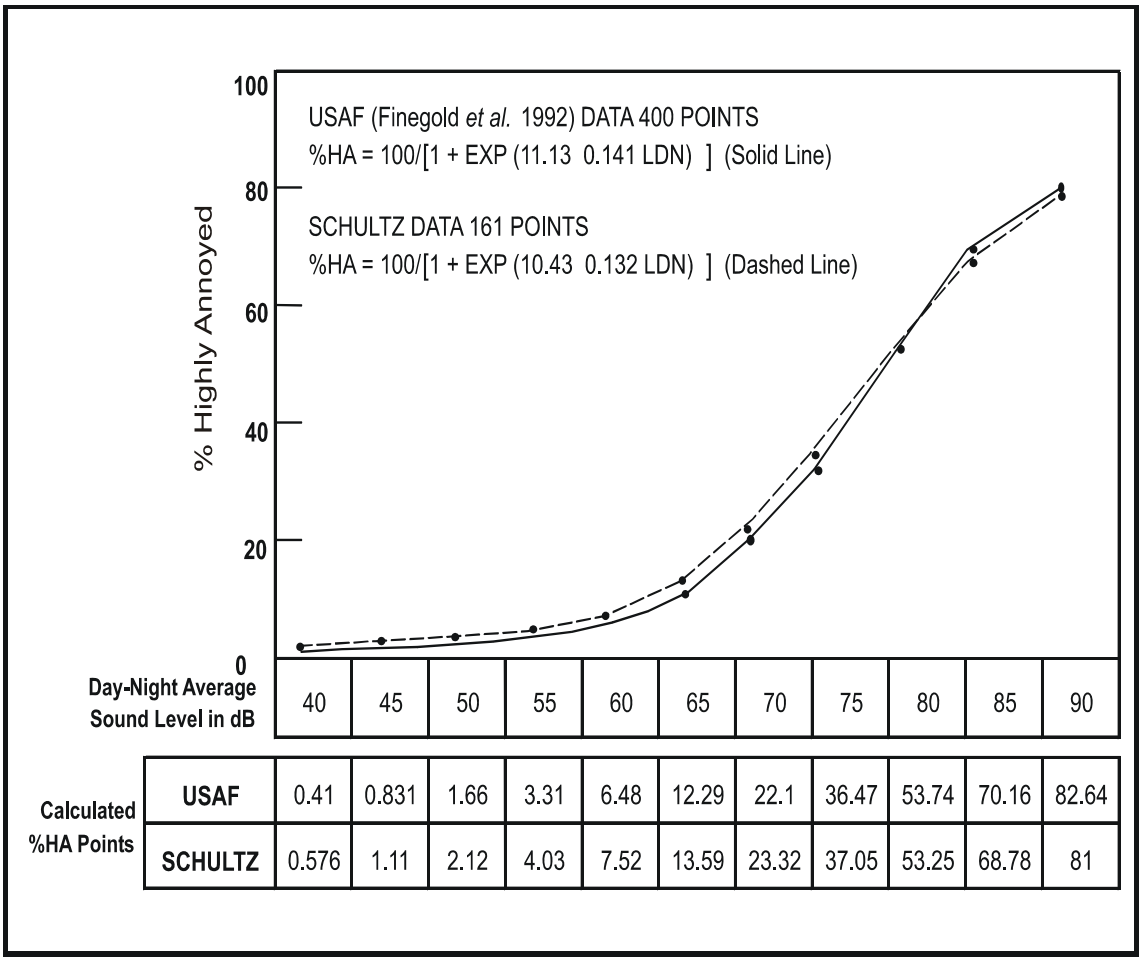


Figure D-3. Response of Communities to Noise; Comparison of Original (Schultz 1978) and Current (Finegold *et al.* 1994) Curve Fits

D.1.2.4 Onset-Rate Adjusted Day-Night Average Sound Level

Aircraft operations along low-altitude Military Training Routes (MTRs) generate a noise environment somewhat different from other community noise environments. Overflights are highly sporadic, ranging from five or ten per day to less than five per week. This situation differs from most community noise environments, in which noise tends to be continuous or patterned. Individual military overflight events also differ from typical community noise events, because of the low-altitude and high-airspeed characteristics of military aircraft operating on MTRs.

To represent these differences, the conventional Day-Night Average Sound Level metric is adjusted to account for the "surprise" effect of the sudden onset of aircraft noise events on humans (Plotkin et al. 1991; Stusnick et al. 1992; Stusnick et al. 1993). For aircraft exhibiting a rate of increase in sound level (called onset rate) of from 15 to 30 dB per second, an adjustment or penalty ranging from 0 to 5 dB is added to the normal Sound Exposure Level. Onset rates above 30 dB per second require a 5 dB penalty, while onset rates below 15 dB per second require no adjustment. The Day-Night Average Sound Level is then determined in the same manner as for conventional aircraft noise events and is designated as Onset-Rate Adjusted Day Night Average Sound Level (abbreviated L_{dnr}). Because of the sporadic occurrences of aircraft overflights along MTRs, the number of average daily operations is determined by using the calendar month with the highest number of operations along the MTR. The monthly average is denoted L_{dnmr}.

D.1.3 Land-Use Compatibility

As noted above, the inherent variability between individuals makes it impossible to predict accurately how any individual will react to a given noise event. Nevertheless, when a community is considered as a whole, its overall reaction to noise can be represented with a high degree of confidence. As described above, the best noise exposure metric for this correlation is the Day-Night Average Sound Level or Onset-Rate Adjusted Day-Night Average Sound Level for military overflights.

In June 1980, an ad hoc Federal Interagency Committee on Urban Noise published guidelines (FICUN 1980) relating Day-Night Average Sound Levels to compatible land uses. This committee was composed of representatives from the United States Departments of Defense, Transportation, and Housing and Urban Development; the Environmental Protection Agency; and the Veterans Administration. Since the issuance of these guidelines, federal agencies have generally adopted these guidelines for their noise analyses.

Following the lead of the committee, the DoD and the FAA adopted the concept of land-use compatibility as the accepted measure of aircraft noise effect. The FAA included the committee's guidelines in the Federal Aviation Regulations (Harris 1984). These guidelines are reprinted in Table D-1, along with the explanatory notes included in the regulation. Although these guidelines are not mandatory (note the footnote "*" in the table), they provide the best means for determining noise impact in airport communities. In general, residential land uses normally are not compatible with outdoor Day-Night Average Sound Levels (L_{dn} values) above 65 dB, and the extent of land areas and populations exposed to L_{dn} of 65 dB and higher provides the best means for assessing the noise impacts of alternative aircraft actions.

Table D-1. Land-Use Compatibility With Yearly Day-Night Average Sound Levels

Land Use	Yearly Day-Night Average Sound Level (DNL) in Decibels					
	Below 65	65–70	70–75	75–80	80–85	Over 85
Residential						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	**N**	**N**
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoria, and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail—building materials, hardware, and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade—general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

Numbers in parentheses refer to notes.

* The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable or unacceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise-compatible land uses.

KEY TO TABLE D-1

Y (YES) = Land Use and related structures compatible without restrictions.
N (No) = Land Use and related structures are not compatible and should be prohibited.
NLR = Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30, or 35 = Land Use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structures.

NOTES FOR TABLE D-1

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor-to-indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide an NLR of 20 dB; thus the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year-round. However, the use of NLR criteria will not eliminate outdoor noise problems.
(2) Measures to achieve NLR 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
(3) Measures to achieve NLR 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
(4) Measures to achieve NLR 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.
(5) Land-use compatible provided special sound reinforcement systems are installed.
(6) Residential buildings require an NLR of 25 dB.
(7) Residential buildings require an NLR of 30 dB.
(8) Residential buildings not permitted.

In 1990, a new Federal Interagency Committee on Noise was formed to review the manner in which aviation noise effects are assessed and presented. This group released its report in 1992 and reaffirmed the use of Day-Night Average Sound Level as the best metric for this purpose (FICON 1992).

Analyses of aircraft noise impacts and compatible land uses around DoD facilities and airspaces are normally made using NOISEMAP (Moulton 1992) and/or MR_NMAP (Lucas and Calamia 1996). These computer-based simulation programs calculate Day-Night Average Sound Levels at many points on the ground around an airfield or military operating area and draw contours of equal level for overlay onto land-use maps of the same scale. Each program mathematically calculates the Sound Exposure Levels of all aircraft operations for a 24-hour period, taking into consideration the number and types of aircraft, their flight paths and engine thrust settings, the time of day (daytime or nighttime) that each operation occurs, and the onset rate, as appropriate. NOISEMAP and ROUTEMAP utilize the same physical models and aircraft performance data and are collectively referred to as "NOISEMAP technology" or simply "NOISEMAP."

Day-Night Average Sound Levels may also be measured directly around an airfield, rather than calculated with NOISEMAP; however, the direct measurement of annualized Day-Night Average Sound Level is difficult and costly since it requires year-round monitoring or careful seasonal sampling.

NOISEMAP provides an accurate projection of aircraft noise around airfields. NOISEMAP also has the flexibility of calculating sound levels at any specified ground location so that noise levels at representative points under flight paths can be ascertained. NOISEMAP is most accurate for comparing "before and after" noise impacts which would result from proposed airfield changes or alternative noise control actions, so long as the various impacts are calculated in a consistent manner.

D.2 NOISE EFFECTS

D.2.1 Hearing Loss

Noise-induced hearing loss is probably the best defined of the potential effects of human exposure to excessive noise. Federal workplace standards for protection from hearing loss allow a time-average level of 90 dB over an 8-hour work period, or 85 dB averaged over a 16-hour period. Even the most protective criterion (no measurable hearing loss for the most sensitive portion of the population at the ear's most sensitive frequency, 4,000 Hz, after a 40-year exposure) suggests a time-average sound level of 70 dB over a 24-hour period (USEPA 1972a). Since it is unlikely that airport neighbors will remain outside their homes 24 hours per day for extended periods of time, there is little possibility of hearing loss below a Day-Night Average Sound Level of 75 dB, and this level is extremely conservative.

D.2.2 Nonauditory Health Effects

Nonauditory health effects of long-term noise exposure, where noise may act as a risk factor, have never been found to occur at levels below those protective against noise-induced hearing loss, described above. Most studies attempting to clarify such health effects have found that

noise exposure levels established for hearing protection will also protect against any potential nonauditory health effects, at least in workplace conditions. The best scientific summary of these findings is contained in the lead paper at the National Institutes of Health Conference on Noise and Hearing Loss, held on 22–24 January 1990 in Washington, D.C., which states the following:

> The nonauditory effects of chronic noise exposure, when noise is suspected to act as one of the risk factors in the development of hypertension, cardiovascular disease, and other nervous disorders, have never been proven to occur as chronic manifestations at levels below these criteria (an average of 75 dBA for complete protection against hearing loss for an eight-hour day). At the recent (1988) International Congress on Noise as a Public Health Problem, most studies attempting to clarify such health effects did not find them at levels below the criteria protective of noise-induced hearing loss, and even above these criteria, results regarding such health effects were ambiguous. Consequently, one comes to the conclusion that establishing and enforcing exposure levels protecting against noise-induced hearing loss would not only solve the noise-induced hearing loss problem but also any potential nonauditory health effects in the work place. [von Gierke 1990; parenthetical wording added for clarification.]

Although these findings were directed specifically at noise effects in the work place, they are equally applicable to aircraft noise effects in the community environment. Research studies regarding the nonauditory health effects of aircraft noise are ambiguous, at best, and often contradictory. Yet, even those studies which purport to find such health effects use time-average noise levels of 75 dB and higher for their research.

For example, in an often-quoted paper, two UCLA researchers apparently found a relation between aircraft noise levels under the approach path to Los Angeles International Airport (LAX) and increased mortality rates among the exposed residents by using an average noise exposure level greater than 75 dB for the "noise-exposed" population (Meecham and Shaw 1979). Nevertheless, three other UCLA professors analyzed those same data and found no relation between noise exposure and mortality rates (Frerichs et al. 1980).

As a second example, two other UCLA researchers used this same population near Los Angeles International Airport to show a higher rate of birth defects during the period of 1970 to 1972 when compared with a control group residing away from the airport (Jones and Tauscher 1978). Based on this report, a separate group at the U.S. Centers for Disease Control performed a more thorough study of populations near Atlanta's Hartsfield International Airport for 1970 to 1972 and found no relation in their study of 17 identified categories of birth defects to aircraft noise levels above 65 dB (Edmonds 1979).

A recent review of health effects, prepared by a Committee of the Health Council of The Netherlands (CHCN 1996) reviewed currently available published information on this topic. They concluded that the threshold for possible long-term health effects was a 16-hour (0600 to 2200) L_{eq} of 70 dB. Projecting this to 24 hours and applying the 10 dB nighttime penalty used with L_{dn}, this corresponds to L_{dn} of about 75 dB. The study also affirmed the risk threshold for hearing loss, as discussed earlier.

In summary, there is no scientific basis for a claim that potential health effects exist for aircraft time-average sound levels below 75 dB.

D.2.3 Annoyance

The primary effect of aircraft noise on exposed communities is one of annoyance. Noise annoyance is defined by the U.S. Environmental Protection Agency (USEPA) as any negative subjective reaction on the part of an individual or group (USEPA 1972a). As noted in the discussion of Day-Night Average Sound Level above, community annoyance is best measured by that metric.

Because the USEPA Levels Document (USEPA 1972a) identified L_{dn} of 55 dB as ". . .requisite to protect public health and welfare with an adequate margin of safety," it is commonly assumed that 55 dB should be adopted as a criterion for community noise analysis. From a noise exposure perspective, that would be an ideal selection. However, financial and technical resources are generally not available to achieve that goal. Most agencies have identified L_{dn} of 65 dB as a criterion which protects those most impacted by noise, and which can often be achieved on a practical basis (FICON 1992). This corresponds to about 13 percent of the exposed population being highly annoyed.

Although L_{dn} of 65 dB is widely used as a benchmark for significant noise impact, and is often an acceptable compromise, it is not a statutory limit and it is appropriate to consider other thresholds in particular cases. In this EA, no specific threshold is used. The noise in each affected area is evaluated on the basis of the information presented in this appendix and in the body of the EA. Particular attention is given to the ideal 55 dB identified by EPA.

D.2.4 Speech Interference

Speech interference associated with aircraft noise is a primary cause of annoyance to individuals on the ground. The disruption of routine activities such as radio or television listening, telephone use, or family conversation gives rise to frustration and irritation. The quality of speech communication is also important in classrooms, offices, and industrial settings and can cause fatigue and vocal strain in those who attempt to communicate over the noise. Research has shown that the use of the Sound Exposure Level metric will measure speech interference successfully, and that a Sound Exposure Level exceeding 65 dB will begin to interfere with speech communication.

D.2.5 Sleep Interference

Sleep interference is another source of annoyance associated with aircraft noise. This is especially true because of the intermittent nature and content of aircraft noise, which is more disturbing than continuous noise of equal energy and neutral meaning.

Sleep interference may be measured in either of two ways. "Arousal" represents actual awakening from sleep, while a change in "sleep stage" represents a shift from one of four sleep stages to another stage of lighter sleep without actual awakening. In general, arousal requires a somewhat higher noise level than does a change in sleep stage.

A recent analysis sponsored by the U.S. Air Force summarized 21 published studies concerning the effects of noise on sleep (Pearsons et al. 1989). The analysis concluded that a

lack of reliable studies in homes, combined with large differences among the results from the various laboratory studies and the limited in-home studies, did not permit development of an acceptably accurate assessment procedure. The noise events used in the laboratory studies and in contrived in-home studies were presented at much higher rates of occurrence than would normally be experienced in the home. None of the laboratory studies were of sufficiently long duration to determine any effects of habituation, such as that which would occur under normal community conditions.

Nevertheless, some guidance is available in judging sleep interference. The USEPA identified an indoor Day-Night Average Sound Level of 45 dB as necessary to protect against sleep interference (USEPA 1972a). Assuming a very conservative structural noise insulation of 20 dB for typical dwelling units, this corresponds to an outdoor Day-Night Average Sound Level of 65 dB as minimizing sleep interference.

A 1984 publication reviewed the probability of arousal or behavioral awakening in terms of Sound Exposure Level (Kryter 1984). Figure D-4, extracted from Figure 10.37 of Kryter 1984, indicates that an indoor Sound Exposure Level of 65 dB or lower should awaken less than 5 percent of those exposed. These results do not include any habituation over time by sleeping subjects. Nevertheless, this provides a reasonable guideline for assessing sleep interference and corresponds to similar guidance for speech interference, as noted above.

D.2.6 Noise Effects on Domestic Animals and Wildlife

Animal species differ greatly in their responses to noise. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its hearing ability usually reflects that role. Animals rely on their hearing to avoid predators, obtain food, and communicate with and attract other members of their species. Aircraft noise may mask or interfere with these functions. Secondary effects may include nonauditory effects similar to those exhibited by humans — stress, hypertension, and other nervous disorders. Tertiary effects may include temporary interference with mating and resultant population declines.

There are available many scientific studies regarding the effects of noise on wildlife and some anecdotal reports of wildlife "flight" due to noise. Few of these studies or reports include any reliable measures of the actual noise levels involved. However, in the absence of definitive data on the effect of noise on animals, the Committee on Hearing, Bioacoustics, and Biomechanics of the National Research Council has proposed that protective noise criteria for animals be taken to be the same as for humans (NRC NAS 1977).

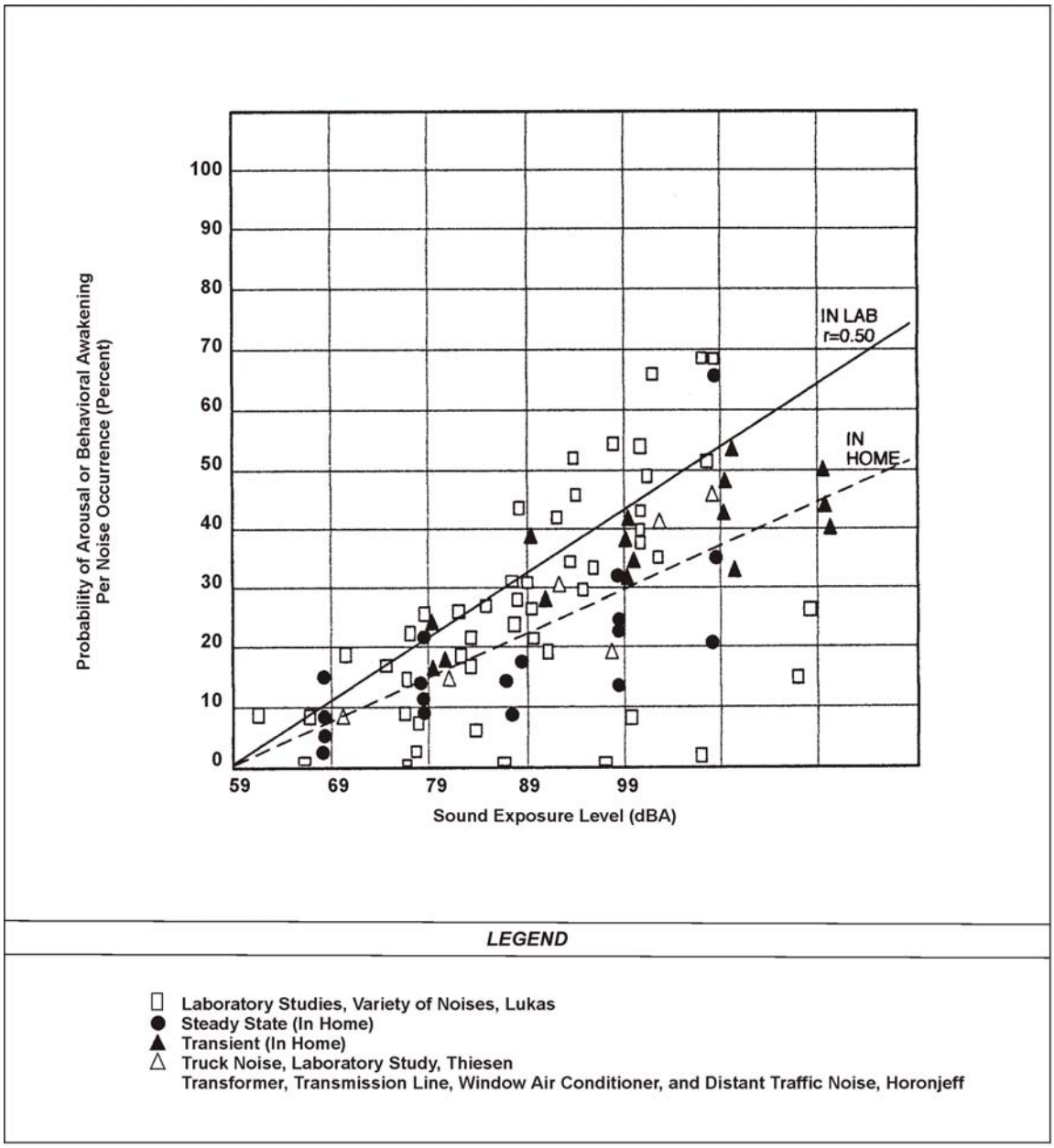


Figure D-4. Probability of Arousal or Behavioral Awakening in Terms of Sound Exposure Level

D.2.7 Noise Effects on Structures

Normally, the most sensitive components of a structure to airborne noise are the windows and, infrequently, the plastered walls and ceilings. An evaluation of the peak sound pressures impinging on the structure is normally sufficient to determine the possibility of damage. In general, at sound levels above 130 dB, there is the possibility of the excitation of structural component resonances. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (NRC NAS 1977).

A recent study, directed specifically at low-altitude, high-speed aircraft on MTRs, showed that there is little probability of structural damage from such operations (Sutherland 1989). One finding in that study is that sound levels at damaging frequencies (e.g., 30 Hz for window breakage or 15 to 25 Hz for whole-house response) are rarely above 130 dB.

Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations, or "rattle," of objects within the dwelling — hanging pictures, dishes, plaques, and bric-a-brac. Window panes may also vibrate noticeably when exposed to high levels of airborne noise, causing homeowners to fear of breakage. In general, such noise-induced vibrations occur at sound levels above those considered normally incompatible with residential land use. Thus, assessments of noise exposure levels for compatible land use should also be protective of noise-induced secondary vibrations.

D.2.8 Noise Effects on Terrain

Members of the public often perceive that noise from low-flying aircraft can cause avalanches or landslides by disturbing fragile soil or snow structures, especially in mountainous areas, causing landslides or avalanches. There are no known instances of such effects, and it is considered improbable that such effects will result from routine, subsonic aircraft operations.

D.2.9 Noise Effects on Historical and Archaeological Sites

Because of the potential for increased fragility of structural components of historical buildings and other historical sites, aircraft noise may affect such sites more severely than newer, modern structures. Again, there are few scientific studies of such effects to provide guidance for their assessment.

One study involved the measurements of sound levels and structural vibration levels in a superbly restored plantation house, originally built in 1795, and now situated approximately 1,500 feet from the centerline at the departure end of Runway 19L at Washington Dulles International Airport (IAD). These measurements were made in connection with the proposed scheduled operation of the supersonic Concorde airplane at Dulles (Wesler 1977). There was special concern for the building's windows, since roughly half of the 324 panes were original. No instances of structural damage were found. Interestingly, despite the high levels of noise during Concorde takeoffs, the induced structural vibration levels were actually less than those induced by touring groups and vacuum cleaning within the building itself.

As noted above for the noise effects of noise-induced vibrations of normal structures, assessments of noise exposure levels for normally compatible land uses should also be protective of historic and archaeological sites.

D.3 REFERENCES

American National Standards Institute (ANSI). 1980. Sound Level Descriptors for Determination of Compatible Land Use. Standard ANSI S3.23-1980.

ANSI. 1988. Quantities and Procedures for Description and Measurement of Environmental Sound, Part 1. Standard ANSI S12.9-1988.

Committee of the Health Council of the Netherlands (CHCN). 1996. Effects of Noise on Health. Noise/News International 4. September.

Edmonds, L.D. 1979. Airport Noise and Teratogenesis. Archives of Environmental Health July/August.

Federal Interagency Committee on Noise (FICON). 1992. Federal Agency Review of Selected Airport Noise Analysis Issues. August.

Federal Interagency Committee on Urban Noise (FICUN). 1980. Guidelines for Considering Noise in Land-Use Planning and Control. June.

Fidell, S., D.S. Barger, and T.J. Schultz. 1991. Updating a Dosage-Effect Relationship for the Prevalence of Annoyance Due to General Transportation Noise. Journal of the Acoustical Society of America 89:221-233.

Fields, J.M. and C.A. Powell. 1985. A Community Survey of Helicopter Noise Annoyance Conducted Under Controlled Noise Exposure Conditions. NASA TM-86400. March.

Finegold, L.S., C.S. Harris, and H.E. von Gierke. 1994. Community Annoyance and Sleep Disturbance: Updated Criteria for Assessing the Impacts of General Transportation Noise on People. Noise Control Engineering Journal 42:January-February.

Frericks, R.R., et al. 1980. Los Angeles Airport Noise and Mortality: Faulty Analysis and Public Policy. American Journal of Public Health 357-362.

Harris, C.M. 1979. Handbook of Noise Control. McGraw-Hill Book Company.

Jones, F.N. and J. Tauscher. 1978. Residence Under an Airport Landing Pattern as a Factor in Teratism. Archives of Environmental Health 10-12.

Kryter, K.D. 1984. Physiological, Psychological, and Social Effects of Noise. NASA Reference Publication 1115, 446. July.

Meacham, W.C. and N. Shaw. 1979. Effects of Jet Noise on Mortality Rates. British Journal of Audiology 77-80.

Moulton, C.L. 1992. Air Force Procedure for Predicting Noise Around Airbases: Noise Exposure Model (NOISEMAP). Technical Report AL-TR-1992-059.

National Research Council/National Academy of Sciences (NRC/NAS). 1977. Guidelines for Preparing Environmental Impact Statements on Noise. Committee on Hearing, Bioacoustics, and Biomechanics.

Pearsons, K.S., D.S. Barber and B.G. Tabachick. 1989. Analyses of the Predictability of Noise-Induced Sleep Disturbance. USAF Report HSD-TR-89-029. October.

Plotkin, K.J., L.C. Sutherland and J.A. Molino. 1987. Environmental Noise Assessment for Military Aircraft Training Routes, Volume II: Recommended Noise Metric. Wyle Research Report WR 86-21. January.

Schultz, T.J. 1978. Synthesis of Social Surveys on Noise Annoyance. Journal of the Acoustical Society of America. 64:377-405.

Stusnick, E., K.A. Bradley, J.A. Molino, and G. DeMiranda. 1992. The Effect of Onset Rate on Aircraft Noise Annoyance. Volume 2: Rented Own-Home Experiment. Wyle Laboratories Research Report WR 92-3. March.

Stusnick, E., K.A. Bradley, M.A. Bossi, and D.G. Rickert. 1993. The Effect of Onset Rate on Aircraft Noise Annoyance. Volume 3: Hybrid Own-Home Experiment. Wyle Laboratories Research Report WR 93-22. December.

Sutherland, L. 1990. Assessment of Potential Structural Damage from Low Altitude Subsonic Aircraft. Wyle Laboratories Research Report WR 89-16. El Segundo, CA.

U.S. Environmental Protection Agency (USEPA). 1972. Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare With an Adequate Margin of Safety. Report 550/9-74-004. March.

von Gierke, H.R. 1990. The Noise-Induced Hearing Loss Problem. NIH Consensus Development Conference on Noise and Hearing Loss, Washington, D.C., 22–24 January 1990.

Wesler, J.E. 1977. Concorde Operations At Dulles International Airport. NOISEXPO '77, Chicago, IL. March.